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HUNTER J.

THE

NATURAL HISTORY

OF THE

HUMAN TEETH:

EXPLAINING THEIR

STRUCTURE, USE, FORMATION,

GROWTH, AND DISEASES.

ILLUSTRATED WITH COPPER-PLATES.

By JOHN HUNTER, F.R.S.

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ERRATA.

Page 28. l. 18. for *Theroide* read *Thyroide*.
38. l. 2. for *mal* read *Animal*.
117. l. 14. dele *to*.

OF THE

UPPER-JAW.

BEFORE we enter into a deſcription of the Teeth themſelves, it will be neceſſary to give an account of the Upper and Lower Jaw-bones, in which they are inſerted; inſiſting minutely on thoſe parts which are connected with the Teeth, or ſerve for their motion and action, and paſſing over the others ſlightly.

The Upper-Jaw is compoſed of two bones, which generally remain diſtinct through life. They are very irregular at their poſterior and upper parts, ſending upwards and backwards a great many proceſſes, that are connected with the bones of the Face and Skull *. The lower and anterior parts of the Upper-Jaw are more uniform, making a kind of a circular ſweep from ſide to ſide, the convexity of which is turned forwards; the lower part terminates in a thick edge, full

* Vide Plate III. Fig. 1ſt and 2d. A A.

of ſockets for the Teeth. This edge is called in each bone the Alveolar Proceſs *. Behind the Alveolar Proceſſes there are two horizontal lamellæ, which uniting together, form part of the roof of the Mouth, which is the partition between the Mouth and the Noſe †.

This plate, or partition, is ſituated about half an inch higher than the lower edge of the Alveolar Proceſs; and this gives the roof of the Mouth a conſiderable hollowneſs.

The uſe of the Upper-Jaw is to form part of the Parietes of the Mouth, Noſe, and Orbits; to give a baſis, or ſupply the Alveolar Proceſs, for the ſuperior row of Teeth, and to counteract the Lower Jaw; but it has no motion itſelf upon the bones of the Head and Face.

* Vide Plate I. Fig. 1. *a*, *b*, *c*, *d*.

† Vide Plate I. Fig. 1. *e*, *e*.

OF THE

LOWER-JAW.

AS the Lower-Jaw is extremely moveable, and its motion is indiſpenſably neceſſary in all the various operations of the Teeth, it requires to be more particularly deſcribed. It is much more ſimple in its form than the Upper, having fewer proceſſes, and theſe not ſo irregular. Its anterior circular part is placed directly under that of the Upper-Jaw; but its other parts extend farther backwards *.

This Jaw is at firſt compoſed of two diſtinct bones †; but theſe, ſoon after birth, unite into one, at the middle of the chin. This union is called the Symphyſis of the Jaw. Upon the upper edge of the body of the bone is placed the Alveolar Proceſs, a good deal ſimilar to that of the Upper-Jaw. The Alveolar Proceſs extends all round the upper part of the bone, from the Coronoide Proceſs of one ſide, to that of the other ‡. In both Jaws they are every where relatively propor-

* Vide Plate III. Fig. 1 and 2.
† Vide Plate VIII. Fig. 1, 4, and 6.
‡ Vide Plate I. Fig. 2.

 tional

tional to the Teeth; being thicker behind, where the Teeth are larger, and more irregular, upon account of the more numerous fangs inſerted into them. The Teeth that are ſituated backwards, in the Upper-Jaw, have more fangs than thoſe that correſpond with them in the lower, and the ſockets are accordingly more irregular. The Alveolar Proceſs of the Upper-Jaw, is a ſection of a larger circle than that of the lower, eſpecially when the Teeth are in the ſockets. This ariſes chiefly from the anterior Teeth in the Upper-Jaw being broader and flatter than thoſe in the Lower *. The poſterior part of the bone on each ſide riſes almoſt perpendicularly, and terminates above in two proceſſes †; the anterior of which is the higheſt, is thin and pointed, and is called the Coronoide Proceſs ‡. The anterior edge of this proceſs forms a ridge, which goes obliquely downward and forward on the Jaw, upon the outſide of the poſterior ſockets §. To this proceſs the Temporal Muſcle is attached; and as it riſes above the center of motion, that Muſcle acts with nearly equal advantage in all the different ſituations of the Jaw.

The Poſterior Proceſs, which is made for a moveable articulation with the head, runs upward, and a

* Vide Plates I. and III.

† Vide Plate III. Fig. 2. *e*; and Plate IV. Fig. 2.

‡ Vide Plate IV. *i i*.

§ Vide Plate IV. Fig. 2. B.

little backward; is narrower, thicker, and ſhorter than the anterior; and terminates in an oblong rounded head, or Condyle *, whoſe longeſt axis is nearly tranſverſe. The Condyle is bended a little forward; is rounded, or convex, from the fore to the back part; and likewiſe a little rounded from one end to the other, or from right to left. Its external end is turned a little forward, and its internal a little backward; ſo that the axis of the two Condyles are neither in the ſame ſtraight line, nor parallel to each other; but the axis of each Condyle, if continued backwards, would meet, and form an angle of about one hundred and forty-ſix degrees; and lines drawn from the Symphyſis of the Chin, to the middle of the Condyle, would interſect their longeſt axis, at nearly right angles †. There are, however, ſome exceptions; for in a Lower-Jaw, of which I have a drawing, the angle formed by the ſuppoſed continuation of the two axes, inſtead of being an angle of one hundred and forty-ſix degrees, is of one hundred and ten only. The Lower-Jaw ſerves for a baſe to ſupport the Teeth in the Alveolar Proceſs, during their action on thoſe of the Upper-Jaw in maſtication; and to give origin to ſome muſcles that belong to other parts.

* Vide Plate IV. Fig. II. E.

† Vide Plate I. Fig. 2. or Plate IV. Fig. 2.

OF THE

ALVEOLAR PROCESSES.

THE Alveolar Proceſſes are compoſed of two thin bony plates, one external *, and the other internal †. Theſe two plates are at a greater diſtance from each other at their poſterior ends, than at the anterior, or middle part of the Jaw. They are united together by thin bony partitions going a croſs, which divide the proceſſes at the anterior part, into juſt as many diſtinct ſockets as there are Teeth ‡; but at the poſterior part, where the Teeth have more than one root or fang, there are diſtinct cells, or ſockets, for every root §. Theſe tranſverſe partitions are more protuberant than the Alveolar Plates; and thus add laterally to the depth of the Cells, particularly at the anterior part of the Jaw. At each partition, the external plate of the Alveolar Proceſs is depreſſed, and forming furrows, or a fluting ‖ rounds the cells, or

* Vide Plate I. Fig. 1. *a*, *a*, *a*, *a*, *a*.
† Vide Plate I. Fig. 1. *b*, *b*, *b*.
‡ Vide Plate I. Fig. 1. *c*, *c*, and Fig. 2, *a*.
§ Vide Plate I. Fig. 1, *d*, *d*. and Fig. 2. *b*, *c*.
‖ Vide Plate III. Fig. 2. F F F F.

cavities, for the roots of the Teeth. This is obſervable in the whole length of the Alveolar Proceſs of the Upper-Jaw; and in the fore-part particularly of the Lower-Jaw. The Alveolar Proceſſes of each Jaw, form about one half of a circular, or rather of an elliptical * figure; and at the fore-part in the Lower-Jaw they are perpendicular, but project inwards at the poſterior part, and deſcribe a ſmaller circle than the body of the bone upon which they ſtand †; as we ſhall obſerve more particularly hereafter, when we come to treat of the Jaws of Old People.

The Alveolar Proceſſes of both Jaws ſhould rather be conſidered as belonging to the Teeth, than as parts of the Jaws; for they begin to be formed with the Teeth, keep pace with them in their growth, and decay, and intirely diſappear, when the Teeth fall; ſo that, if we had no Teeth, it is likely we ſhould not only have no ſockets, but not even theſe proceſſes, in which the ſockets are formed; and the Jaws can perform their motions, and give origin to muſcles, without either the Teeth, or Alveolar Proceſſes. In ſhort, there is ſuch a mutual dependence of the Teeth, and Alveolar Proceſſes on each other, that the deſtruction of the one ſeems to be always attended with that of the other.

* Vide Plate I. Fig. 1. and 2.

† Vide Plate I. Fig. 2.

In

In the head of a young ſubject which I examined, I found that the two firſt Inciſor Teeth in the Upper-Jaw had not cut the Gum; nor had they any root or fang, excepting ſo much as was neceſſary to faſten them to the Gum, on their upper ſurface; and on examining the Jaw, I found there was no Alveolar Proceſs, nor ſockets, in that part. What had been the cauſe of this, I will not pretend to ſay: whether it was owing to the Teeth forming not in the Jaw, but in the Gum; or to the waſting of the fangs. The appearance of the Tooth favoured the firſt ſuppoſition; for it was not like thoſe, whoſe fangs are decayed in young ſubjects, in order to the ſhedding of the Teeth; and as it did not cut the Gum, it is reaſonable to think it never had any fang. That end from which the fang ſhould have grown, was formed into two round and ſmooth points, having each a ſmall hole leading into the body of the Tooth, which was pretty well formed.

ARTICULATION of the LOWER-JAW.

JUST under the beginning of the Zygomatic Proceſs of each Temporal Bone, before the external Meatus Auditorius, an oblong cavity may be obſerved; in direction, length, and breadth, in ſome meaſure correſponding with the Condyle of the Lower-Jaw *. Before, and adjoining to this cavity, there is an oblong eminence, placed in the ſame direction, convex upon the top, in the direction of its ſhorter axis, which runs from behind forwards; and a little concave in the direction of its longer axis, which runs from within outwards. It is a little broader at its outer extremity; as the outer correſponding end of the Condyle deſcribes a larger circle in its motion than the inner †. The ſurface of the cavity, and eminence, is covered with one continued ſmooth cartilaginous cruſt, which is ſomewhat ligamentous, for by putrefaction it peels off, like a membrane, with the common Perioſteum. Both the cavity and eminence ſerve for the mo-

* Vide Plate II. L. and Plate IV. E E.

† Vide Plate II. K. and Plate XIV. F F.

tion of the Condyle of the Lower-Jaw. The ſurface of the cavity is directed downward; that of the eminence downward and backward, in ſuch a manner that a tranſverſe ſection of both would repreſent the Italick letter *S* *. Though the eminence may, on a firſt view of it, appear to project conſiderably below the cavity, yet a line drawn from the bottom of the cavity, to the moſt depending part of the eminence, is almoſt horizontal, and therefore nearly parallel with the line made by the grinding ſurfaces of the Teeth in the Upper-Jaw: and when we conſider the Articulation farther, we ſhall find that theſe two lines are ſo nearly parallel, that the Condyle moves almoſt directly forwards, in paſſing from the cavity to the eminence; and the paralleliſm of the motion is alſo preſerved by the ſhape of an intermediate cartilage.

In this joint there is a moveable cartilage, which, though common to both Condyle and cavity, ought to be conſidered rather as an appendage of the former than of the latter, being more cloſely connected with it; ſo as to accompany it in its motion along the common ſurface of both the cavity and eminence. This cartilage is nearly of the ſame dimenſions with the Condyle, which it covers; is hollowed on its inferior ſurface, to receive the Condyle: on its upper ſurface it is more unequal, being moulded to the cavity and eminence of the ar-

* Vide Plate II. I, K.

ticu-

ticulating ſurface of the Temporal Bone, though it is conſiderably leſs, and is therefore capable of being moved with the Condyle, from one part of that ſurface to another *. Its texture is ligamento-cartilagineous. This moveable cartilage is connected with both the Condyle of the Jaw, and the articulating ſurface of the Temporal Bone, by diſtinct ligaments, ariſing from its edges all round. That by which it is attached to the Temporal Bone, is the moſt free and looſe; though both ligaments will allow an eaſy motion, or ſliding of the cartilage on the reſpective ſurfaces of the Condyle, and Temporal Bone. Theſe attachments of the cartilage are ſtrengthened, and the whole articulation ſecured, by an external ligament, which is common to both, and which is fixed to the Temporal Bone, and to the neck of the Condyle. On the inner ſurface of the ligament, which attaches the cartilage to the Temporal Bone, and backwards, in the cavity, is placed what is commonly called the Gland of the Joint; at leaſt, the ligament is there much more vaſcular than at any other part.

* Vide Plate II. L.

OF THE

MOTION in the JOINT of the LOWER-JAW.

THE Lower-Jaw, from the manner of its articulation, is ſuſceptible of a great many motions. The whole Jaw may be brought horizontally forwards, by the Condyles ſliding from the cavity towards the eminences on each ſide. This motion is performed chiefly when the Teeth of the Lower-Jaw are brought directly under thoſe of the Upper, in order to bite, or hold any thing very faſt between them.

Or, the Condyles only may be brought forwards, while the reſt of the Jaw is tilted backwards, as in the caſe when the Mouth is open; for on that occaſion the angle of the Jaw is tilted backwards, and the chin moves downwards, and a little backwards alſo. In this laſt motion, the Condyle turns its face a little forwards; and the center of motion lies a little below the Condyle, in the line between it and the angle of the Jaw. By ſuch an advancement of the Condyles forwards, together with the rotation mentioned, the aperture of the Mouth may be conſiderably enlarged; a circumſtance neceſſary on many obvious occaſions.

The

The Condyles may alſo ſlide alternately backwards and forwards, from the cavity to the eminence, and *vice verſa*; ſo that while one Condyle advances, the other moves backwards, turning the body of the Jaw from ſide to ſide, and thus grinding, between the Teeth, the morſel ſeparated from the larger maſs by the motion firſt deſcribed. In this caſe, the center of motion lies exactly in the middle between the two Condyles. And it is to be obſerved, that in theſe ſlidings of the Condyles forwards and backwards, the moveable cartilages do not accompany the Condyles in the whole extent of their motion; but only ſo far as to adapt their ſurfaces to the different inequalities of the Temporal Bone: for as theſe cartilages are hollow on their lower ſurfaces where they receive the Condyle, and on their oppoſite upper ſurfaces are convex where they lie in the cavity; but forwards, at the root of the eminence, that upper ſurface is a little hollowed; if they accompanied the Condyles through the whole extent of their motion, the eminences would be applied to the eminences, the cavities would not be filled up, and the whole articulation would be rendered very inſecure.

This account of the motion of the Lower-Jaw, and its cartilages, clearly demonſtrates the principal uſe of theſe cartilages; namely, the ſecurity of the articulation; the ſurfaces of the cartilage accommodating themſelves to the different inequalities, in the various and

free motions of this joint. This cartilage is alſo very ſerviceable for preventing the parts from being hurt by the friction; a circumſtance neceſſary to be guarded againſt, where there is ſo much motion. Accordingly, I find this cartilage in the different tribes of Carnivorous Animals, where there is no eminence and cavity, nor other apparatus for grinding; and where the motion is of the true ginglimus kind only.

In the Lower-Jaw, as in all the joints of the body, when the motion is carried to its greateſt extent, in any direction, the muſcles and ligaments are ſtrained, and the perſon made uneaſy. The ſtate, therefore, into which every joint moſt naturally falls, eſpecially when we are aſleep, is nearly in the middle, between the extremes of motion; by which means all the muſcles and ligaments are equally relaxed. Thence it is, that commonly, and naturally, the Teeth of the two Jaws are not in contact; nor are the Condyles of the Lower-Jaw ſo far back in the Temporal Cavities as they can go.

MUSCLES of the LOWER-JAW.

HAVING described the figure, Articulation, Motion, and use of the Lower-Jaw, it will be necessary, in the next place, to give some account of the Muscles that are the causes of its motion.

There are five pair of Muscles, each of them capable of producing various motions, according to the situation of the Lower-Jaw, whether they act singly, or in conjunction with others; and two or more of them may be so situated, as to be capable of moving the Jaw in the same direction; and every motion is produced by the action of more than one Muscle at a time. Thus, if the Jaw is depressed, and brought to one side, either the Masseter, Temporal, or Pterigoidæus internus of the opposite side will not only raise the Jaw, but bring it to its middle state. It will be necessary in the description of each Muscle, to give its use in the different situations of the Jaw; by which means, after they are all described, their compound actions will be better understood. I shall first describe those which raise the Jaw; then those which give it the lateral motion; and

lastly,

laſtly, thoſe which depreſs it; proceeding in each claſs as they riſe in diſſection.

The moſt ſuperficial is the Maſſeter: it is ſituated upon the poſterior and lower part of the Face, between the cheek-bone, and angle of the Lower-Jaw, directly before the lower part of the Ear. It is a thick, ſhort, complex Muſcle, and a little flattened: it appears to have two diſtinct origins, an anterior outer, and a poſterior inner; but that is owing only to its outer edge at its origin being ſlit, or double; and the fibres of theſe two edges having a different courſe, decuſſating each other a little. The anterior, and outer portion of the Muſcle begin to riſe from a ſmall part of the lower edge of the Malar Proceſs of the Maxillary Bone, adjoining to the Os Malæ; and continues its origin all along the lower horizontal edge of this laſt bone, to the angle where its Zygomatic Proceſs turns up, to join that of the Temporal Bone. The external layer of fibres in this portion are tendinous at their beginnings, while the internal are fleſhy.

The poſterior and inner portion of this Muſcle begins to riſe partly tendinous, and partly fleſhy, from the ſame lower edge of the Os Malæ; not where the origin of the other portion terminates, but a little farther forwards; and this origin is continued along the lower edge of the Zygomatic Proceſs of the Tem-

poral

poral Bone, as far backwards as the eminence belonging to the articulation of the Lower-Jaw.

From this extent of its origin, the Muſcle paſſes downwards to its inſertion into the Lower Jaw. The anterior external portion is broader at its inſertion than at its origin; for it occupies a triangular ſpace of the Lower-Jaw above the angle, and on the outſide, of about an inch in ſize, to about an inch and a half from the angle towards the Chin. In conſequence of this extent of inſertion, the fibres of this portion divaricate very conſiderably. They are moſtly fleſhy at their inſertion, a few only being tendinous, particularly thoſe that are inſerted backwards. The poſterior and inner portion of the Maſſeter is narrower at its inſertion than at its origin; its poſterior fibres running forwards, as well as downwards, while its anterior run almoſt directly downwards. It occupies in its inſertion the remaining part of the ſcabrous ſurface, above the angle of the Lower-Jaw, which lies between the anterior portion and the two upper proceſſes, viz. the Condyle and Coronoide. As the anterior fibres of this portion riſe on the inſide of the poſterior fibres of the other portion; and as its poſterior fibres run forwards as well as downwards, and its anterior run almoſt directly downwards, while the fibres of the other portion radiate both forwards and backwards; theſe two portions in ſome meaſure decuſſate, or croſs one an-

other. The anterior fibres, which run fartheſt and loweſt down, are tendinous at their inſertion, while the poſterior and ſhorteſt are fleſhy.

The uſe of the whole Muſcle is to raiſe the Lower-Jaw; and when it is brought forwards, the poſterior and inner portion will aſſiſt in bringing it a little back; ſo that this Muſcle becomes a rotator, if the Jaw happens to be turned to the oppoſite ſide.

We may obſerve, that this Muſcle is intermixed with a number of tendinous portions, both at its origin and its inſertion; which give riſe to a greater number of fleſhy fibres, and thereby add to the ſtrength of the Muſcle.

TEMPO-

TEMPORALIS.

IT is ſituated on the ſide of the Head, above, and ſomewhat before the Ear. It is a pretty broad, flat, and radiated Muſcle; broad and thin at its origin; narrow and thick at its inſertion; and is covered with a pretty ſtrong Faſcia, above the Jugum.

This Faſcia is fixed to the bones round the whole circumference of the origin of the Muſcle. Above, it is fixed to a ſmooth white line, that is obſervable upon the Skull, extending from a little ridge on the lateral part of the Os Frontis, continued acroſs the Parietal Bone, and making a turn towards the Mamillary Proceſs. It is fixed below, to the ridge where the Zygomatic Proceſs begins, juſt above the Meatus Auditorius; then to the upper edge of the Zygomatic Proceſs itſelf, and anteriorly to the Os Malæ. This adheſion, anteriorly, above, and poſteriorly, gives, as it were, the circumference of the origin of the Temporal Muſcle.

This Muſcle ariſes from all the bones of the ſide of the Head, that are within the line, for inſertion of the tendinous Faſcia, viz. from the lower and lateral part of the Parietal Bone, from all the ſquammous portion of

the Temporal Bone, from the lower and lateral part of the Os Frontis, from all the Temporal Proceſs of the Os Sphenoides, and often from a proceſs at the lower part of this ſurface, (which portion, however, is often common to this Muſcle, and the Pterygoidæus externus) and from the poſterior ſurface of the Os Malæ. Outwardly, it riſes from the inner ſurface of the Jugum, and from the whole inner ſurface of the Faſcia above deſcribed. At this origin, from the Jugum it is not to be diſtinguiſhed from the Maſſeter, being there, in fact, one and the ſame Muſcle; and indeed the Maſſeter is no more than a continuation of the ſame origin, under the edge of the Jugum; and might properly enough be reckoned the ſame, both as to its origin and inſertion, and in ſome meaſure in its uſe alſo.

The origin is principally fleſhy; and the Muſcle paſſes from it, in general, downwards, and a little forwards, converging, and forming a thin middle tendon. After which the Muſcle runs downwards, on the inſide of the Jugum, and is inſerted into the Coronoid Proceſs of the Lower-Jaw, on both ſides tendinous and fleſhy, but principally tendinous. It reaches farther down upon the inſide of the Coronoid Proceſs, than upon the outer ſide, where the inſertion is continued as low as the body of the bone.

The

The poſterior and inferior edge of this Muſcle paſſes over the root of the Zygomatic Proceſs of the Temporal Bone, as over a pulley, which confines the action of the Muſcle to that of raiſing the Lower-Jaw, more than if its fibres had paſſed in a direct courſe from their origin to their inſertion.

The uſe of the Temporal Muſcle, in general, is to raiſe the Lower-Jaw; and as it paſſes a little forwards to its inſertion, it muſt bring the Condyle at the ſame time backwards, and ſo counteract the Pterygoidæus externus of the oppoſite ſide; and if both Muſcles act, they counteract both the Pterygoidæi, by bringing back the whole of the Jaw.

PTERYGOIDÆUS INTERNUS.

IT is ſituated upon the inſide of the Lower-Jaw, oppoſite to the Maſſeter, which is upon the outſide. It is a ſtrong ſhort Muſcle, a little flattened, eſpecially at its inſertion. It ariſes tendinous and fleſhy from the whole internal ſurface of the external Ala of the Sphenoid Bone; from the external ſurface of the internal Ala, near its bottom; from that proceſs of the Os Palati that makes part of the Foſſa Pterygoidæa; likewiſe from the anterior rounded ſurface of that proceſs, where it is connected to the Os Maxillare ſuperius. From thence the Muſcle paſſes downwards, a little outwards and backwards, and is inſerted tendinous and fleſhy into the inſide of the Lower-Jaw, from the angle, up almoſt to the groove for the admiſſion of the Maxillary Nerve, where the ſurface of the bone is remarkably ſcabrous.

The Uſe of this Muſcle is to raiſe the Lower-Jaw; and from its direction, one would ſuſpect that it would bring the Condyle a little forwards; but this motion is contrary to that of the Lower-Jaw, for it is naturally brought back when raiſed.

PTERY-

PTERYGOIDÆUS EXTERNUS,

IS ſituated immediately between the external ſurface of the external Ala of the Pterygoid Proceſs, and the Condyle of the Lower-Jaw; lying, as it were, horizontally along the baſis of the Skull. It is ſomewhat radiated in ſome bodies; broad at the origin, and ſmall at the inſertion; but the greater part of it forms a round ſtrong fleſhy belly; ſo that the part that makes it of the radiated kind is thin.

The thick and ordinary portion of it ariſes tendinous and fleſhy, from almoſt the whole external ſurface of the external Ala of the Pterygoid Proceſs of the Sphenoid Bone, excepting a little bit of the root at the poſterior edge; and towards the lower part, it ariſes a little from the inner ſurface of that Ala. The thin portion ariſes from a ridge of the Sphenoid, that is continued from the proceſs towards the Temple, juſt behind the Foramen Lacerum inferius, which terminates in a little protuberance. This origin is ſometimes wanting; and in that caſe, the Temporal Muſcle ariſes from that protuberance; and very often this origin is common to both. Theſe two origins of this Muſcle are ſometimes ſo much ſeparated, as to make it a Biceps.

From theſe origins the Muſcle paſſes outwards, and a little backwards, converging; that is, the ſuperior fibres paſſing outwards and backwards, and a little downwards; while the inferior, or larger portion of it, paſſes a little upward.

It is inſerted tendinous and fleſhy into a depreſſion on the anterior part of the Condyle and Neck of the Lower-Jaw, upon the inſide of that ridge, which is continued from the Coronoid Proceſs. Likewiſe a little portion into the anterior part of the moveable cartilage. A little portion is likewiſe inſerted into the anterior part of the moveable cartilage of the joint.

When this Muſcle acts ſingly it is a rotator; for it brings the Condyle of the Jaw forwards, and likewiſe the moveable cartilage, which throws the Chin to the oppoſite ſide: but if it acts in conjunction with its fellow of the oppoſite ſide, inſtead of being turned to one ſide, the whole Jaw is brought forwards, and thus theſe counteract the Temporal, &c.

Theſe two Muſcles generally act alternately; and when they do ſo, one acts at the time of depreſſion, the other at the time of elevation; ſo that theſe Muſcles act, both when the Lower-Jaw is raiſed, and when it is depreſſed: yet they do not aſſiſt either in raiſing or depreſſing it.

DIGAS-

DIGASTRICUS.

IT is ſituated immediately under, and a little upon the inſide of the Lower-Jaw, and outſide of the Fauces, extending from the Maſtoid Proceſs to the Chin, nearly along the angle made by the Neck and Chin, or Face *. The name of this Muſcle expreſſes its general ſhape, as it has two fleſhy bellies, and of courſe a middle tendon. Yet ſome of its anterior belly does not ariſe from the tendon of the poſterior, but from the Faſcia, which binds it to the Os Hyoides. Theſe two fleſhy bellies do not run in the ſame line, but form an angle, juſt where the tendon runs into the anterior belly; ſo that this tendon ſeems rather to belong to the poſterior, which is the thickeſt and longeſt.

This Muſcle ariſes from the Sulcus made by the inſide of the Maſtoid Proceſs, and a ridge upon the Temporal Bone, where it is united with the Os Occipitis. The extent of this origin is about an inch: it is fleſhy upon its outer part, viz. that from the Maſtoid Proceſs, and tendinous on the inſide from the ridge. From its

* Vide Plate II. E F.

origin it passes forwards, downwards, and a little inwards, much in the direction of the posterior edge of the Mammillary Process; and forms a round tendon first in its center and upper surface. This tendon passes on in the same direction; and when got near the Os Hyoides, it commonly perforates the anterior end of the Stylo Hyoideus Muscle; and from the lower edge of this tendon, some fibres seem to go off, which degenerate into a kind of Fascia, that binds it to the Os Hyoides; and some of it goes across the lower part of the Mylo-Hyoidæus, and joins its fellow on the opposite side; binding the Os Hyoides by a kind of belt. At this part the tendon becomes a little broader, makes a turn upwards, inwards, and forwards, and gives origin to the anterior belly, which passes on in the same direction, to the lower part of the Chin, where it is inserted tendinous and fleshy, into a slight depression on the under, and a little on the posterior part of the Lower-Jaw, almost contiguous to its fellow. Besides the attachment of the middle tendon to the Os Hyoides, there is a ligamentous binding, which serves, in some measure, as a pulley. This is more marked in some subjects than in others; and this depends on the strength of the tendinous expansion, which binds the tendon of the Digastricus to the Os Hyoides.

When we say that these parts are attached to the

Os Hyoides, we do not mean that they can be traced quite into it, like ſome other tendons in the body; but the Os Hyoides ſeems to be the moſt fixt point of attachment. Very often we find two anterior bellies to each Muſcle; the uncommon one, which is the ſmalleſt, does not paſs to the Chin, but joins with a ſimilar portion of the other ſide, in a middle tendon, which is often fixed to the Os Hyoides. At other times, we find ſuch a portion on one ſide only; in which caſe it is commonly fixed to the middle tendon of the Mylo-Hyoidæus.

The uſe of theſe Muſcles with regard to the Lower-Jaw, is principally to depreſs it; but according as one acts a little more forcibly than the other, it thereby gives the Jaw a ſmall rotation; and becomes, in that reſpect, a kind of antagoniſt to the Pterygoidæus Externus. Beſides depreſſing the Lower-Jaw, when we examine the dead body, they would appear to raiſe the Larynx. But although they have this effect, a proper attention to what happens in the living body, will probably ſhew, that their principal action is to depreſs the Lower-Jaw, and that they are the Muſcles which are commonly employed for this purpoſe. Let a Finger be placed on the upper part of the Sterno-Maſtoidæus Muſcle, juſt behind the poſterior edge of the Maſtoid Proceſs, about its middle, touching that edge a little with the finger; then depreſs the Lower-

Jaw, and the poſterior head of the Digaſtric will be felt to ſwell very conſiderably, and ſo as to point out the direction of the Muſcle. In this there can be no deception; for there is no other Muſcle in this part that has the ſame direction; and thoſe who are of opinion that the Digaſtric does not depreſs the Lower-Jaw, will more readily allow this, when they are told, that we find the ſame head of the Muſcle act in deglutition; but not with a force equal to that which it exerts in depreſſing the Lower-Jaw. Further, if the Sterno-Hyoidei, Sterno-Thyroidei, and Coſto-Hyoidei, acting at the ſame time with the Mylo-Hyoidei, and Genio-Hyoidei, aſſiſted in depreſſing the Jaw, the Os Hyoides, and Thyroide Cartilage, would probably be depreſſed, as the bellies of the Sterno-Hyoidei, and of the other lower muſcles, are by much the longeſt; but on the contrary, we find that the Os Hyoides, with the Theroide Cartilage, is a little raiſed in the depreſſion of the Jaw, which we may ſuppoſe to be done by the anterior belly of the Digaſtric: and ſecondly, if theſe Muſcles were to act to bring about this motion of the Jaw, theſe parts would be brought forwards, nearer to the ſtraight line between the Chin and Sternum, which is not the caſe in this action; whereas we find it to be the caſe in deglutition, in which theſe evidently act. By applying our Fingers upon the Genio-Hyoideus, and Mylo-Hyoideus, near the Os Hyoides, between the two anterior bellies of the Digaſtric, (not near the Chin,

where

where the action of these two bellies may occasion a mistake), we find these Muscles quite flaccid; which is not the case in deglutition, nor in speaking, in which they certainly do act; nor do we find the Muscles under the Os Hyoides at all affected, as they are in the motion of the Larynx.

It has been observed, that when we open the mouth, while we keep the Lower-Jaw fixed, the forepart of the Head or Face is necessarily raised. Authors have been at a good deal of pains to explain this. Some of them considered the Condyles of the Jaw, as the center of motion; but if this were the case, that part of the Head, where it articulates with the Spine, and of consequence the whole body, must be depressed, in proportion as the Upper-Jaw is raised; which is not true in fact. Others have considered the Condyles of the Occiput as the center of motion; and they have conceived the Extensor Muscles of the Head to be the moving powers. The Muscles which move the Head in this case, are pointed out by two circumstances, which attend all muscular motion; in the first place, all actions of our body have Muscles immediately adapted to them; and secondly, when the mind wills any particular action, its power is applied by instinct to those Muscles only, which are naturally adapted to that motion; and further, the mind being accustomed to see the part move which is naturally the most moveable, attends to its motion in the volition, although

though it be in that inſtance fixed, and the other parts of the body move towards it; and although the other parts of the body might be brought towards it by other Muſcles, and would be ſo, if the mind intended that they ſhould come towards it, yet theſe Muſcles are not brought into action. Thus the Flexors of the Arm commonly move the hand to the body; but if the hand be fixed, the body is moved by the ſame Muſcles to the hand. In this caſe, however, the mind wills the motion of the hand towards the body, and brings the Flexors into action; whereas if it wiſhed to bring the body towards the hand, the Muſcles of the forepart of the body would be put into action, and this would produce the ſame effect.

To apply this to the Lower-Jaw; when we attempt to open the Mouth, while the Lower-Jaw is immoveable, we fix our attention upon the very ſame Muſcles (whatever they are) which we call into action, when we depreſs the Lower-Jaw; and we find that we act with the very ſame Muſcles; for our mind attends to the depreſſing of the Jaw, and not the raiſing of the face; and under ſuch circumſtances the mouth is actually opened. We find then by theſe means the head is raiſed; and the idea that we have of this motion, is the ſame that we have in the common depreſſion of the Jaw; and we ſhould not know, except from circumſtances, that the Jaw was not really depreſſed; and

we

we find at this time too, that the Extenſors of the head are not in action. On the contrary, when the Jaw is fixed in the ſame ſituation, if we have a mind to raiſe the head, or Upper-Jaw, which of courſe muſt open the mouth, we fix our attention to the Muſcles that move the head backwards, without having the idea of opening our mouth; and at this time the Extenſors of the head act. This plainly ſhows, that the ſame Muſcles which depreſs the Jaw, when moveable, muſt raiſe the head, when the Jaw is kept fixed.

This is a proof too, that there are no other Muſcles employed in depreſſing the Lower-Jaw, than what will raiſe the head under the circumſtances mentioned. This will further appear from the ſtructure of the parts; wherein four things are to be conſidered, viz. the articulation of the Jaw; the articulation of the Head with the Neck; the origin, and the inſertion of Digaſtric Muſcle.

* Suppoſe A, the Upper-Jaw, to be fixed, and the Lower-Jaw B, to be moveable on the Condyle C: if the Digraſtic contracts, its origin E, and inſertion F will approach towards one another; in which caſe it is evident, that the Lower-Jaw will move downwards and backwards. But if the Lower-Jaw be fixed, as in the caſe ſuppoſed, and the Vertebræ G G G be alſo fixed,

* Vide Plate II.

the

the Condyle will move upwards and forwards upon the eminence in the joint, the forepart of the head will be puſhed upwards and backwards by the Condyle, and the hind part of the head will be drawn down; ſo that the whole ſhall make a kind of circular motion upon the upper Vertebræ; and the Digaſtric Muſcle pulling the hind part of the head towards the Lower-Jaw, and at the ſame time puſhing up the Condyles againſt the fore-part of the head, acquires, by this mechaniſm, a very conſiderable additional power.

OF

STRUCTURE of a TOOTH.

And, First, of the ENAMEL.

A Tooth is compoſed of two ſubſtances, viz. Enamel and Bone. The Enamel, called likewiſe the vitreous, or cortical part, is found only upon the body of the Tooth, and is there laid all around, on the outſide of the bony, or internal ſubſtance *. It is by far the hardeſt part of our body; inſomuch that the hardeſt and ſharpeſt ſaw will ſcarce make an impreſſion upon it, and we are obliged to uſe a file in dividing or cutting it. When it is broken it appears fibrous or ſtriated; and all the fibres or ſtriæ are directed from the circumference to the center of the Tooth †.

This, in ſome meaſure, both prevents it from breaking in maſtification, as the ſibres are diſpoſed in arches, and keeps the Tooth from wearing down, as the ends of the fibres are always acting on the food.

* Vide Plate XIV. Fig. 14, 15, and 17.
† Vide Plate XIV. Fig. 21, 22, and 23.

The Enamel is thickeſt on the grinding ſurface, and on the cutting edges, or points, of the Teeth; and becomes gradually thinner on the ſides, as it approaches the neck, where it terminates inſenſibly, though not equally low, on all ſides of the Teeth *. On the baſe or grinding ſurface it is of a pretty equal thickneſs, and therefore is of the ſame form with the bony ſubſtance which it covers †.

It would ſeem to be an earth united with a portion of animal ſubſtance, as it is not reducible to quick lime by fire, till it has firſt been diſſolved in an acid. When a Tooth is put into a weak acid, the Enamel, to appearance, is not hurt; but on touching it with the fingers, it crumbles down into a white pulp. The Enamel of Teeth, expoſed to any degree of heat, does not turn to lime: it contains animal mucilaginous matter; for when expoſed to the fire, it becomes very brittle, cracks, grows black, and ſeparates from the incloſed bony part of the Tooth. It is capable, however, of bearing a greater degree of heat than the bony part, without becoming brittle and black ‡. This ſubſtance has no marks of being vaſcu-

* Vide Plate XIV. Fig. 21, 22, and 23.

† Vide Ditto.

‡ From this circumſtance we can ſhew the Enamel better by burning a Tooth, as the bony part becomes black ſooner than the Enamel. The method of burning, and ſhewing them after they are burnt, is as follows.——Let one half of a Tooth be filed away, from one end to the other, then burn it gently in the fire; after this is done, waſh the filed ſurface

lar, and of having a circulation of fluids: the moſt ſubtile injections we can make never reach it; it takes no tinge from feeding with madder, even in the youngeſt animals; and, as was obſerved above, when ſoaked in a gentle acid, there appears no *griſtly* or *fleſhy* part, with which the earthy part had been incorporated *.

We ſhall ſpeak of the uſe and formation of the Enamel hereafter, when they will be better underſtood.

ſurface with an acid, or ſcrape it with a knife. By this method you will clean the edge of the Enamel, which will remain white, and the bony part will be found black.

* In all theſe experiments I never could obſerve, that the Enamel was in the leaſt tinged, either in the growing or formed Tooth. This looks as if the Enamel were the earth more fully depurated, or ſtrained off from the common juices in ſuch a manner, as not to allow the groſs particles of madder to paſs. Here it may not be amiſs to remark, that the names given to animal ſubſtance, ſuch as Gluten, &c. are not in the leaſt expreſſive of the thing meant; for there is no ſuch thing as glue in an animal, till it has either undergone a putrefactive proceſs, or been changed by heat. And here too I would be underſtood, that I call earth no part of an animal; nor does it make up any part of an animal ſubſtance.

OF THE

BONY PART of a TOOTH.

THE other ſubſtance of which a Tooth is compoſed, is bony; but much harder than the moſt compact part of bones in general. This ſubſtance makes the interior part of the body, the neck, and the whole of the root of a Tooth. It is a mixture of two ſubſtances, viz. calcarious earth and an animal ſubſtance, which we might ſuppoſe to be organized and vaſcular. The earth is in very conſiderable quantity; it remains of the ſame ſhape after calcination, ſo that it is in ſome meaſure kept together by coheſion; and it is capable of being extracted by ſteeping in the muriatic, and ſome other acids. The animal ſubſtance, when deprived of the earthy part, by ſteeping in an acid, is more compact than the ſame ſubſtance in other bones, but ſtill is ſoft and flexible.

That part of a Tooth which is bony, is nearly of the ſame form as a complete Tooth; and thence, when the Enamel is removed, it has the ſame ſort of edge, point, or points, as when the Enamel remained. We cannot by injection prove that the bony part of a Tooth is vaſ-

vaſcular: but from ſome circumſtances it would appear that it is ſo; for the Fangs of Teeth are liable to ſwellings, ſeemingly of the ſpina ventoſa kind, like other bones; and they ſometimes anchyloſe with the ſocket by bony and inflexible continuity, as all other contiguous bones are apt to do. But there may be a deception here, for the ſwelling may be an original formation, and the anchyloſis may be from the pulp that the Tooth is formed upon being united with the ſocket. The following conſiderations would ſeem to ſhew that the Teeth are not vaſcular: firſt, I never ſaw them injected in any preparation, nor could I ever ſucceed in any attempt to inject them, either in young or old ſubjects; and therefore believe that there muſt have been ſome fallacy in the caſes where they have been ſaid to be injected. Secondly, we are not able to trace any veſſels going from the pulp into the ſubſtance of the new-formed Tooth; and whatever part of a Tooth is formed, it is always completely formed, which is not the caſe with other bones. But what is a more convincing proof, is reaſoning from the analogy between them and other bones, when the animal has been fed with madder. Take a young animal, viz. a pig, and feed it with madder, for three or four weeks; then kill the animal, and upon examination you will find the following appearance: firſt, if this animal had ſome parts of its Teeth formed before the feeding with madder, thoſe parts will be known by their remaining of this natural colour;

but

but ſuch parts of the Teeth as were formed while the mal was taking the madder, will be found to be of a red colour. This ſhews, that it is only thoſe parts that were forming while the animal was taking the madder that are dyed; for what were already formed will not be found in the leaſt tinged. This is different in all other bones; for we know that any part of a bone which is already formed, is capable of being dyed with madder, though not ſo faſt as the part that is forming; therefore as we know that all other bones when formed are vaſcular, and are thence ſuſceptible of the dye, we may readily ſuppoſe that the Teeth are not vaſcular, becauſe they are not ſuſceptible of it after being once formed. But we ſhall carry this ſtill farther; if you feed a pig with madder for ſome time, and then leave it off for a conſiderable time before you kill the animal, you will find the above appearances ſtill ſubſiſting, with this addition, that all the parts of the Teeth which were formed after leaving off feeding with the madder will be white. Here then in ſome Teeth we ſhall have white, then red, and then white again; and ſo we ſhall have the red and the white colour alternately through the whole Tooth.

This experiment ſhews, that the Tooth once tinged, does not loſe its colour; now as all other bones that have been once tinged loſe their colour in time, when the animal leaves off feeding with madder (though very ſlowly), and as that dye muſt be taken into the

conſtitution by the abſorbents, it would ſeem that the Teeth are without abſorbents, as well as other veſſels.

This ſhews that the growth of the Teeth is very different from that of other bones. Bones begin at a point, and ſhoot out at their ſurface; and the part that ſeems already formed, is not in reality ſo, for it is forming every day by having new matter thrown into it, till the whole ſubſtance is complete; and even then it is conſtantly changing its matter.

Another circumſtance in which Teeth ſeem different from bone, and a ſtrong circumſtance in ſupport of their having no circulation in them, is that they never change by age, and ſeem never to undergo any alteration, when completely formed, but by abraſion; they do not grow ſofter, like the other bones, as we find in ſome caſes, where the whole earthy matter of the bones has been taken into the conſtitution.

From theſe experiments it would appear, that the Teeth are to be conſidered as extraneous bodies, with reſpect to a circulation through their ſubſtance; but they have moſt certainly a living principle, by which means they make part of the body, and are capable of uniting with any part of a living body; as will be explained hereafter: and it is to be obſerved, that affections of the whole body have leſs influence upon the Teeth than

than any other part of the body. Thus in children affected with the rickets, the Teeth grow equally well as in health, though all the other bones are much affected; and hence their Teeth being of a larger size in proportion to the other parts, their mouths are protuberant.

OF

OF THE

CAVITY of the TEETH.

EVERY Tooth has an internal Cavity, which extends nearly the whole length of its bony part *. It opens, or begins at the point of the fang, where it is ſmall; but in its paſſage becomes larger, and ends in the body of the Tooth †. This end is exactly of the ſhape of the body of the Tooth to which it belongs. In general it may be ſaid, that the whole of the Cavity is nearly of the ſhape of the Tooth itſelf, larger in the body of the Tooth, and thence gradually ſmaller to the extremity of the fang; ſimple, where the Tooth has but one root ‡; and in the ſame manner compounded, when the Tooth has two or more fangs §.

This Cavity is not cellular, but ſmooth in its ſurface: it contains no marrow, but appears to be filled with

* Vide Plate XIV. Fig. 1, 2, 3, &c.
† Vide Plate XIV. Fig. 1, 2. 3. &c.
‡ Vide Plate XIV. Fig. 3, 4, 5, and 6.
§ Vide Plate XIV. Fig. 1, 2.

blood-veſſels *, and, I ſuppoſe, nerves, united by a pulpy or cellular ſubſtance. The veſſels are branches of the ſuperior and inferior Maxillaries; and the nerves muſt come from the ſecond and third branches of the fifth pair.

By injections we can trace the blood-veſſels diſtinctly through the whole Cavity of the Tooth; but I could never trace the Nerves diſtinctly even to the beginning of the Cavity.

* Vide Plate XII. Fig. 7, 8.

OF THE

PERIOSTEUM of the TEETH.

THE Teeth, as we obſerved, are covered by an Enamel only at their bodies; but at their fangs they have a Perioſteum, which, though very thin, is vaſcular, and appears to be common to the Tooth which it incloſes, and the ſocket, which it lines as an inveſting internal membrane, It covers the Tooth a little beyond the bony ſocket, and is there attached to the Gum.

OF THE

SITUATION of the TEETH.

THE general ſhape and ſituation of the Teeth are obvious. The oppoſition of thoſe of the two Jaws, and the circle which each row deſcribes, need not be particularly explained, as they may be very well ſeen in the living body, and may be ſuppoſed to be already underſtood, from what was ſaid of the Alveolar Proceſſes.

We may juſt obſerve, with regard to the ſituation of the two rows, that when they are in the moſt natural ſtate of contact, the Teeth of the Upper-Jaw project a little beyond the lower Teeth, even at the ſides of the Jaws; but ſtill more remarkably at the fore part, where in moſt people the upper Teeth lie before thoſe of the Lower-Jaw *: and at the lateral part of each row, the line, or ſurface of contact, is hollow from behind forwards, in the Lower-Jaw; and in the ſame proportion it is convex in the Upper-Jaw †.

* Vide Plate III. Fig. 1, 2.
† Vide Plate III. Fig. 1, 2.

The edge of each row is ſingle at the fore part of the Jaws; but as the Teeth grow thicker backwards, it there ſplits into an internal and external edge. The canine Tooth, which we ſhall call *Cuſpidatus*, is the point from which the two edges go off; ſo that the firſt grinder, or what we ſhall call the firſt *Bicuſpis*, is the firſt Tooth that has a double edge *.

* Vide Plate IV. Fig. 1, 2.

NUMBER of TEETH.

THEIR Number in the whole, at full maturity, is from twenty-eight to thirty-two: I once ſaw twenty-ſeven only, never more than thirty-two. Fourteen of them are placed in each Jaw, when the whole number is no more than twenty-eight; and ſixteen, when there are thirty-two. If the whole be twenty-nine or thirty-one in number, the Upper-Jaw ſometimes, and ſometimes the Lower, has one more than the other; and when the Number is thirty, I find them ſometimes divided equally between the two Jaws; and in other ſubjects ſixteen of them are in one Jaw, and fourteen in the other. In ſpeaking of the Number of Teeth, I am ſuppoſing that none of them have been pulled out, or otherwiſe loſt; but that there are from eight to twelve of thoſe large poſterior Teeth, which I call Grinders, and that they are ſo cloſe planted as to make a continuity in the circle: and in this caſe, when the number is leſs than thirty-two, the deficiency is in the laſt grinder.

The Teeth differ very much in figure from one another; but thoſe on the right ſide in each Jaw reſemble exactly

exactly thoſe on the left, ſo as to be in pairs; and the pairs belonging to the Upper-Jaw nearly reſemble the correſponding Teeth of the Lower-Jaw in ſituation, figure, and uſe *.

Each Tooth is divided into two parts, viz, firſt, the body, or that part of it which is the thickeſt, and ſtands bare beyond the Alveoli and Gums; ſecondly, the fang, or root, which is lodged within the Gum and Alveolar Proceſs: and the boundary between theſe two parts, which is graſped by the edge of the Gum, is called the Neck of a Tooth. The bodies of the different Teeth differ very much in ſhape and ſize, and ſo do their roots. The difference muſt be conſidered hereafter.

The Teeth of each Jaw are commonly divided into three claſſes, viz. *Inciſors*, *Canine*, and *Grinders*; but from conſidering ſome circumſtances of their form, growth and uſe, I chuſe to divide them into the four following claſſes, viz. *Inciſores*, commonly called Fore Teeth; *Cuſpidati*, vulgarly called *Canine*; *Bicuſpides*, or the two firſt Grinders; and *Molares*, or the three laſt Teeth. The number of each claſs, in each Jaw, for the moſt part, is four *Inciſores*, two *Cuſpidati*, four *Bicuſpides*, and four, five, or ſix *Molares*.

* Vide Plate III. IV. V.

There

There is a regular gradation, both in growth and form through theſe claſſes, from the *Inciſores* to the *Molares*, in which reſpect the *Cuſpidati* are of a middle nature, between the *Inciſores* and *Bicuſpides*, as the laſt are between the *Cuſpidati* and *Molares*; and thence the *Inciſores* and *Molares* are the moſt unlike in every circumſtance * †.

* Vide Plate III. and V.

† It is here to be underſtood, that the Teeth from which we take our deſcription, are ſuch as are juſt completely formed, and therefore not in the leaſt worn down by maſtication. Our deſcription of each claſs is taken from the Lower-Jaw; and the difference between them, and their correſponding claſſes in the Upper immediately follows that deſcription.

INCISORES.

THE *Inciſores* are ſituated in the anterior part of the Jaw; the others more backwards on each ſide, in the order in which we have named them. The bodies of the *Inciſores* are broad, having two flat ſurfaces, one anterior, the other poſterior. Theſe ſurfaces meet in a ſharp cutting edge. The anterior ſurface is convex in every direction, and placed almoſt perpendicularly; and the poſterior is concave and ſloping, ſo that the cutting edge is almoſt directly over the anterior ſurface *.

Theſe ſurfaces are broadeſt and the Tooth is thinneſt at the cutting edge, or end of the Tooth, and thence they become gradually narrower and the Tooth thicker towards the neck, where the ſurfaces are continued to the narroweſt ſide, or edge of the fang. The body of an *Inciſor*, in a ſide-view, grows gradually thicker, or broader, from the edge or end of the Tooth to its neck; and theſe coincide with the flat, or broad ſide of the fang; ſo that when we look on the fore part, or on the

* Vide Plate XIV. and Plate V. row 3, 4.

back part of an *Inciſor*, we obſerve it grows conſtantly narrower from its cutting edge to the extremity of its fang. But in a ſide-view it is thickeſt or broadeſt at its neck, and thence becomes gradually more narrow, both to its cutting edge, and to the point of its fang *.

The Enamel is continued farther down, and is thicker on the anterior and back part of the *Inciſores* than on their ſides, and is even a little thicker on the fore part than upon the back part of the Tooth. If we view them laterally, either when intire, or when cut down through the middle, but eſpecially in the latter caſe, it would ſeem as if the fang was driven like a wedge into, and had ſplit the body or Enamel of the Tooth †. They ſtand almoſt perpendicularly, their bodies being turned a little forwards. Their fangs are much ſhorter than thoſe of the *Cuſpidati*, but pretty much of the ſame length with all the other Teeth of this Jaw ‡.

In the Upper-Jaw they are broader and thicker, eſpecially the two firſt: their length is nearly the ſame with thoſe of the Lower-Jaw. They ſtand a little obliquely, with their bodies turned much more forwards (the firſt eſpecially) and they generally fall over thoſe of the Under-Jaw.

* Vide Plate V.
† Vide Plate XIV. Fig. 17.
‡ Vide Plate III. Fig. 2.

The

The two firſt *Inciſores* cover the two firſt, and half of the ſecond of the Lower-Jaw, ſo that the ſecond *Inciſor* in the Upper-Jaw covers more than half of the ſecond, and more than the half of the *Cuſpidatus* of the Under-Jaw *.

The edges of the *Inciſores* by uſe and friction, in ſome people, become blunt and thicker; and in others they ſharpen one another, and become thinner.

* Vide Plate III. Fig. 1.

CUSPIDATUS.

THE *Cuſpidatus* is the next after the *Inciſores* in each Jaw; ſo that there are four of them in all. They are in general thicker than the *Inciſores*, and conſiderably the longeſt of all the Teeth *.

The ſhape of the body of the *Cuſpidatus* may be very well conceived, by ſuppoſing an *Inciſor*, with its corners rubbed off, ſo as to end in a narrow point, inſtead of a thin edge †; and the fang differs from that of an *Inciſor*, only in being much larger ‡.

The outſide of the body of a *Cuſpidatus* projects moſt at the ſide next the *Inciſores*, being there more angular than any where elſe.

* Vide Plate VI. Fig. 1. Plate V. Row 1, 3d Fig. *bb*.
† Vide Plate IV. Fig. 1, at *bb*.
‡ Vide Plate VI. Fig. 1.

The

The Enamel covers more of the lateral parts of these Teeth than of the *Inciſores*; they ſtand perpendicularly, or nearly ſo, projecting farther out in the circle than the others, ſo that the two *Cuſpidati* and the four *Inciſores* often ſtand almoſt in a ſtraight line, eſpecially in the Lower-Jaw.

This takes place only in adults, and in them only when the ſecond Teeth are rather too large for the arch of the Jaw; for we never find this when the Teeth are at any diſtance from one another, or in young ſubjects. Their points commonly project beyond the horizontal line formed by the row of Teeth, and their fangs run deeper into the Jaws, and are oftener a little bent.

In the Upper-Jaw they are rather longer, and do not project much beyond the circle of the adjacent Teeth; and in this Jaw they are not placed vertically, their bodies being turned a little forwards and outwards.

When the Jaws are cloſed, the *Cuſpidatus* of the Upper-Jaw falls between, and projects a little over the *Cuſpidatus* and firſt *Bicuſpis* of the Lower-Jaw. When they are a little worn down by uſe, they commonly firſt take an edge ſomewhat like a worn *Inciſor*, and afterwards become rounder.

The

The uſe of the *Cuſpidati* would ſeem to be, to lay hold of ſubſtances, perhaps even living animals; they are not formed for dividing as the *Inciſores* are; nor are they fit for grinding. We may trace in theſe Teeth a ſimilarity in ſhape, ſituation, and uſe, from the moſt imperfectly carnivorous animal, which we believe to be the human ſpecies, to the moſt perfectly carnivorous, viz. the lion.

OF THE

BICUSPIDES.

IMmediately behind the *Cuſpidati*, in each Jaw, ſtand two Teeth, commonly called the firſt and ſecond Grinders, but which, for reaſons hinted at above, I ſhall ſuppoſe to conſtitute a particular claſs, and call them *Bicuſpides*.

Theſe (viz. the fourth and fifth Tooth from the ſymphyſis of the Jaw) reſemble each other ſo nearly, that a deſcription of the firſt will ſerve for both. The firſt indeed is frequently the ſmalleſt, and has rather the longeſt fang, having ſomewhat more of the ſhape of the *Cuſpidatus* than the ſecond.

The body of this Tooth is flattened laterally, anſwering to the flat ſide of the fang. It terminates in two points, viz. one external and one internal. The external is the longeſt and thickeſt; ſo that on looking into the mouth from without, this point only can be ſeen, and the Tooth has very much the appearance of a *Cuſpidatus*; eſpecially the firſt of theſe Teeth. The internal point

is the leaſt, and indeed ſometimes ſo very ſmall, that the Tooth has the greateſt reſemblance to a *Cuſpidatus* in any view *. At the union of the points the Tooth is thickeſt, and thence it loſes in thickneſs, from ſide to ſide, to the extremity of the fang; ſo that the fang continues pretty broad to the point, and is often forked there. All the Teeth hitherto deſcribed often have their points bent, and more particularly the *Cuſpidati*.

The Enamel paſſes ſomewhat farther down externally and upon the inſide, than laterally; but this difference is not ſo conſiderable as in the *Inciſores*, and *Cuſpidati*; in ſome indeed it terminates equally all round the Tooth. They ſtand almoſt perpendicularly, but ſeem to be a little turned inwards, eſpecially the laſt of them.

In the Upper-Jaw they are rather thicker than in the Lower, and are turned a very little forwards and outwards. The firſt in the Upper-Jaw falls between the two in the Lower. The ſecond falls between the ſecond and the firſt Grinder: and both project over thoſe of the Lower-Jaw, but leſs than the *Inciſores* and *Cuſpidati*.

The *Bicuſpides*, and eſpecially the ſecond of them, in both Jaws, are oftener naturally wanting than any of

* Vide Plate IV. Fig. 1, 2, *c c*.

the Teeth, except the *Dentes Sapientiæ*; thence we might conjecture that they are leſs uſeful; and this conjecture appears leſs improbable, when we conſider, that in their uſe they are of a middle nature between Cutters and Grinders; and that in moſt animals, ſo far as I have obſerved, there is a vacant ſpace between the Cutters and Grinders. I have alſo ſeen a Jaw in which the firſt *Bicuſpis* was of the ſame ſhape and ſize as a Grinder, and projected, for want of room, between the *Cuſpidatus* and ſecond *Bicuſpis*. Theſe and the Grinders alter very little in ſhape on their grinding ſurfaces by uſe; their points only wear down, and become obtuſe.

OF THE

GRINDERS.

IN deſcribing the Grinders we ſhall firſt conſider the firſt and ſecond conjunctly, becauſe they are nearly the ſame in every particular; and then give an account of the third or laſt Grinder, which differs from them in ſome circumſtances.

The two firſt Grinders differ from the Bicuſpides, principally in being much larger, and in having more points upon their body, and more fangs *.

The body forms almoſt a ſquare, with rounded angles. The grinding ſurface has commonly five points, or protuberances, two of which are on the inner, and three on the outer part of the Tooth; and generally ſome ſmaller points at the roots of theſe larger protuberances. Theſe protuberances make an irregular cavity in the middle of the Tooth. The three outer points do not ſtand ſo near the outer edge of the Tooth, as the inner do on the inſide; ſo that the body of the Tooth

* Vide Plate IV. Fig. 1, 2, *d d.*

ſwells

ſwells out more from the points, or is more convex, on the outſide. The body towards its neck becomes but very little ſmaller, and there divides into two flat fangs, one forwards, the other backwards, with their edges turned outwards and inwards, and their ſides conſequently forwards and backwards: the fangs are but very little narrower at their ends, which are pretty broad, and often bifurcated. There are two cavities in each fang, one towards each edge, leading to the general cavity in the body of the Tooth. Theſe two cavities are formed by the meeting of the ſides of the fang in the middle, thereby dividing the broad and flat cavity into two *; and all along the outſide of theſe (and all the other flat fangs) there is a correſponding longitudinal groove. Theſe fangs at their middle, are generally bent a little backwards †.

The Enamel covers the bodies of theſe Teeth pretty equally all round.

The firſt Grinder is ſomewhat larger and ſtronger than the ſecond; it is turned a little more inwards than the adjacent *Bicuſpides*, but not ſo much as the ſecond Grinder. Both of them have generally ſhorter fangs than the *Bicuſpides*.

* Vide Plate XIV. Fig. 7, where four dark ſpots are obſerved.
† Vide Plate VI. Fig. 1.

There is a greater difference between theſe Grinders in the Upper and Lower-Jaw, than any of the other Teeth. In the Upper-Jaw they are rather rhomboidal, than ſquare in their body, with one ſharp angle turned forwards and outwards, the other backwards and inwards; beſides they have three fangs, which diverge, and terminate each in a point; theſe are almoſt round, and have but one cavity. Two of them are placed near each other perpendicularly, over the outſide of the Tooth; and the other, which generally is the largeſt, ſtands at a greater diſtance on the inſide of the Tooth, ſlanting inwards. In this Jaw theſe two Grinders are inclined outwards, and a little forwards; they project a little over the correſponding Teeth of the Lower-Jaw, and they are placed further back in the mouth, ſo that each is partly oppoſed to two of the Lower-Jaw. The ſecond in the Upper-Jaw is ſmaller than the others, and the firſt and ſecond are placed directly under the Maxillary Sinus. I once ſaw the ſecond Grinder naturally wanting on one ſide of the Lower-Jaw.

The third Grinder is commonly called *Dens Sapientiæ*; it is a little ſhorter and ſmaller than the others, and inclined a little more inwards and forwards. Its body is nearly of the ſame figure, but rather rounder, and its fangs are generally not ſo regular and diſtinct, for they often appear ſqueezed together; and ſometimes there is only one fang, which makes the Tooth conical: it is much

much ſmaller than the reſt of the Grinders. In the Upper-Jaw this Tooth has more variety than in the Lower, and is even ſmaller than the correſponding Tooth of the Lower, and thence ſtands directly oppoſed to it; but for this circumſtance the Grinders would reach farther back in the Upper-Jaw than in the Lower, which is not commonly the caſe.

In the Upper-Jaw this third Grinder is turned but a very little outwards; is frequently inclined ſomewhat backwards; and it projects over that of the Under-Jaw. It oftener becomes looſe than any of the other Teeth.

They are placed under the poſterior part of the Maxillary Sinus, and there the parts which compoſe the Sinus are thicker than in the middle. The variations as to the natural number of the Teeth, depend commonly upon theſe *Dentes Sapientiæ*.

Thus from the *Inciſores* to the firſt Grinder, the Teeth become gradually thicker at the extremity of their bodies, and ſmaller from the firſt Grinder to the *Dens Sapientiæ*. From the *Cuſpidatus* to the *Dens Sapientiæ* the fangs become much ſhorter; the *Inciſores* are nearly of the ſame length with the *Bicuſpides*. From the firſt *Incyſor* to the laſt Grinder, the Teeth ſtand leſs out from the ſockets and Gums.

The

The bodies of the Teeth in the Lower-Jaw are turned a little outwards at the anterior part of the Jaw, and thence, to the third Grinder, they are inclined gradually more inwards. The Teeth in the Upper-Jaw project over thoſe of the Under, eſpecially at the fore-part, which is owing to the greater obliquity of the Teeth in the Upper-Jaw; for the circle of the ſockets is nearly the ſame in both Jaws. This oblique ſituation, however, becomes gradually leſs, from the *Inciſores* backwards, to the laſt Grinder, which makes them gradually project leſs in the ſame proportion.

The Teeth in the Upper-Jaw are placed farther back in the circle than the correſponding Teeth of the Lower; this is owing to the two firſt *Inciſores* above being broader than the correſponding *Inciſores* below. All the Teeth have only one fang, except the Grinders, each of which has two in the Lower-Jaw, and three in the Upper *.

The fangs bear a proportion to the bodies of the Teeth; and the reaſon is evident, for otherwiſe they would have been eaſily broken, or puſhed out of their ſockets. The force commonly applied to them is oblique, not perpendicular; and they are not ſo firmly fixed in

* Thoſe Anatomiſts who allow the Teeth to have more fangs, have been led into a miſtake, I ſuppoſe, by often obſerving two canals in one fang; and thence concluded, that ſuch a fang was originally two, and that theſe were now grown together.

the

the Upper-Jaw, that is, the Alveolar Proceſs in that is not ſo ſtrong as in the Under-Jaw: it is perhaps on this account, that the Grinders in that Jaw have three fangs.

This particular ſtructure in the Alveolar Proceſs of the Upper-Jaw, is perhaps to give more room for the *Antrum Highmorianum*; on this ſuppoſition the fangs muſt be made accordingly, *i. e.* ſo that they ſhall not be puſhed into that cavity; now, by their diverging, they incloſe as it were the bottom of the *Antrum*, and do not puſh againſt its middle, which is the weakeſt part; and the points of three diverging fangs will make a greater reſiſtance (or not be ſo eaſily puſhed in) than if they were placed parallel. If there had been only two, as in the Lower-Jaw, they muſt have been placed oppoſite to the thinneſt part of the *Antrum*; and three points placed in any direction but a diverging one, would have had here much the ſame effect as two; and as the force applied is endeavouring to depreſs the Tooth, and puſh it inwards, the innermoſt fang diverges moſt, and is ſupported by the inner wall of the *Antrum*. That all this weakneſs in the Upper-Jaw is for the increaſe of the *Antrum* is probable, becauſe all the Teeth in the Upper-Jaw are a good deal ſimilar to thoſe in the Lower, excepting thoſe that are oppoſite to the Maxillary Sinus; and here they differ principally in the fangs, without any other apparent reaſon; and

what

what confirms this, is, that the *Dentes Sapientiæ* in both Jaws are more alike than the other Grinders; for this reaſon, as I apprehend, becauſe the *Dens Sapientiæ* in the Upper-Jaw, does not interfere ſo much with the Maxillary Sinus.

What makes it ſtill more probable that the two firſt ſuperior Grinders have three fangs on account of the Maxillary Sinus, is, that the two Grinders on each ſide of the Upper-Jaw, in the child, have three fangs, and we find them underneath the *Antrum*; but thoſe that ſucceed them have only one fang, as in the Lower-Jaw; but by that time the *Antrum* has paſſed further back, or rather the arch of the Jaw has projected, or ſhot forwards, as it were, from under the *Antra*, ſo that the Alveolar Proceſſes that were under the *Antrum* at one age, are got before it in another.

That the edge of every fang is turned towards the circumference of the Jaw, in order to counteract the acting power, we ſhall ſee when we conſider the Motion of the Jaw, and the Uſe of the Teeth.

OF

ARTICULATION of the TEETH.

THE fangs of the Teeth are fixed in the Gum and Alveolar Proceſſes, by that ſpecies of Articulation called Gomphoſis, which, in ſome meaſure, reſembles a nail driven into a piece of wood *.

They are not, however, firmly united with the Proceſſes, for every Tooth has ſome degree of motion; and in heads which have been boiled or macerated in water, ſo as to deſtroy the Perioſteum and adheſion of the Teeth, we find the Teeth ſo looſely connected with their ſockets, that all of them are ready to drop out, except the Grinders, which remain as it were hooked from the number and ſhape of their fangs.

* Vide Plate I. for the ſockets; and Plate VI. for the Teeth themſelves in their ſockets.

OF

THE GUMS.

THE Alveolar Proceſſes are covered by a red vaſcular ſubſtance, called the Gums, which has as many perforations as there are Teeth; and the neck of a Tooth is covered by, and fixed to this Gum. Thence there are fleſhy partitions between the Teeth, paſſing between the external and internal Gum, and, as it were, uniting them; theſe partitions are higher than the other parts of the Gum, and thence form an arch between every two adjacent Teeth. The thickneſs of that part of the Gum which projects beyond the ſockets is conſiderable; ſo that when the Gum is corroded by diſeaſe, by boiling, or otherwiſe, the Teeth appear longer, or leſs ſunk into the Jaw. The Gum adheres very firmly in a healthful ſtate both to the Alveolar Proceſs and to the Teeth, but its extreme border is naturally looſe all around the Teeth. The Gum, in ſubſtance, has ſomething of a cartilaginous hardneſs and elaſticity, and is very vaſcular, but ſeems not to have any great degree of ſenſibility; for though we often wound it in eating, and in picking our Teeth, yet we do not feel much pain upon theſe occaſions; and both in infants and old people,

where there are no Teeth, the Gums bear a very conſiderable preſſure, without pain.

The advantage ariſing from this degree of inſenſibility in the Gums is obvious, for till the child cuts its Teeth, the Gums are to do the buſineſs of Teeth, and are therefore formed for this purpoſe, having a hard ridge running through their whole length. Old people, who have loſt their Teeth, have not this ridge. When in a ſound ſtate, the Gums are not eaſily irritated by being wounded, and therefore are not ſo liable to inflammation as other parts, and ſoon heal.

The Teeth being united to the Jaw by the Perioſteum and Gum, have ſome degree of an yielding motion in the living body. This circumſtance renders them more ſecure; it breaks the jar of bony contact, and prevents fractures both of the ſockets and of the Teeth themſelves.

OF THE

ACTION of the TEETH, ariſing from the Motion of the Lower-Jaw.

THE Lower-Jaw may be ſaid to be the only one that has any motion in maſtication; for the Upper-Jaw can only move with the other parts of the head. That the Upper-Jaw and head ſhould be raiſed in the common act of opening the mouth, or chewing, would ſeem, at firſt ſight, improbable; and from an attentive view of the mechaniſm of the joints and muſcles of thoſe parts, from experiment and obſervation, we find that they do not ſenſibly move. We ſhall only mention one experiment in proof of this, which ſeems concluſive: let a man place himſelf near ſome fixed point, and look over it, to another diſtant and immoveable object, when he is eating. If his head ſhould riſe in the leaſt degree, he would ſee more of the diſtant object over the neareſt fixed point, which in fact he does not. The nearer the fixed point is, and the more diſtant the object, the experiment will be more accurate and convincing. The reſult of the experiment will be the ſame, if the neareſt point has the ſame motion with the head; as, when he looks from under the edge of a hat, or any thing elſe put upon

upon his head, at ſome diſtant fixed object. We may conclude then that the motion is entirely in the Lower-Jaw: and, as we have already deſcribed both the articulation and the motion of the bone, we ſhall now explain the action of maſtication, and, at the ſame time, conſider the uſe of each claſs of Teeth.

With regard to the action of the Teeth of both Jaws, in maſtication, we may obſerve, once for all, that their action and re-action muſt be always equal, and that the Teeth of the Upper and Lower-Jaws are complete, and equal antagoniſts both in cutting and grinding.

When the Lower-Jaw is depreſſed, the Condyles ſlide forwards on the eminences; and they return back again into the cavities, when the Jaw is completely raiſed.

This ſimple action produces a grinding motion of the Lower-Jaw, backwards on the Upper, and is uſed when we divide any thing with our fore Teeth, or *Inciſores*. For this purpoſe, the *Inciſores* are well formed; as they are higher than the others, their edges muſt come in contact ſooner; and as the Upper project over the Under, we find in dividing any ſubſtance with them, that we firſt bring them oppoſite to one another, and as they paſs through the part to be divided, the Lower-Jaw is brought back, while the Inciſors of that Jaw ſlide up behind thoſe of the Upper-Jaw, and of courſe

paſs

paſs by one another. In this way they complete the diviſion, like a pair of ſciſſars ; and at the ſame time they ſharpen one another. There are exceptions to this ; for theſe Teeth in ſome people meet equally, viz. in thoſe people whoſe Fore-Teeth do not project further from the Gum, or ſocket, than the back Teeth; and ſuch Teeth are not ſo fit for dividing ; and in ſome people the Teeth of the Lower-Jaw are ſo placed, as to come before thoſe of the Upper-Jaw ; this ſituation is as favourable for cutting as when the over-lapping of the Teeth is the reverſe, except for this circumſtance, that the Lower-Jaw muſt be longer, and therefore its action weaker.

The other motion of the Lower-Jaw, viz. when the lateral Teeth are uſed, is ſomewhat different from the former. In opening the mouth, one Condyle ſlides a little forwards, and the other ſlides a little further back into its cavity ; this throws the Jaw a little to that ſide, juſt enough to bring the lower Teeth directly under their correſponding Teeth in the Upper-Jaw : this is done, either in dividing, or holding of ſubſtances; and theſe are the Teeth that are generally uſed in the laſt mentioned action. When the true grinding motion is to be performed, a greater degree of this laſt motion takes place ; that is, the Condyle of the oppoſite ſide is brought farther forwards, and the Condyle of the ſame ſide is drawn farther back into the cavity of the Temporal Bone, and the Jaw is a little depreſſed.

ed. This is only preparatory for the effect to be produced; for the moving back of the firſt mentioned Condyle into the ſocket, is what produces the effect in maſtication.

The lateral Teeth in both Jaws are adapted to this oblique motion; in the Lower they are turned a little inwards, that they may act more in the direction of their axis; and here the Alveolar Proceſs is ſtrongeſt upon the outſide, being there ſupported by the ridge at the root of the Coronoid Proceſs. In the Upper-Jaw the obliquity of the Teeth is the reverſe, that is, they are turned outwards, for the ſame reaſon; and the longeſt fang of the Grinders is upon the inſide, where the ſocket is ſtrengthened by the bony partition between the *antrum* and noſe. Hence it is, that the Teeth of the Lower-Jaw have their outer edges worn down firſt; and, *vice verſa*, in the Upper-Jaw.

GENERAL COMPARISONS

BETWEEN THE

MOTION of the JAW in young and in old People.

IN children who have not yet Teeth, there does not ſeem to be a ſliding motion in the Lower-Jaw. The articular eminence of the Temporal Bone is not yet formed, and the cavity is not larger than the Condyle; therefore the center of motion in ſuch, muſt be in the Condyle. In old people, who have loſt their Teeth, the centre of motion appears to be in the Condyles, and the motion of their Jaw to be only depreſſion and elevation. They never depreſs the Jaw ſufficiently to bring the Condyle forwards on the eminence, becauſe in them the mouth is ſufficiently opened when the Jaw is in its natural poſition.

Hence it is that in old people, the gums of the two Jaws do not meet in the fore-part of the mouth *, and they cannot bite at that part ſo well, as at the ſide of the Jaw; and, inſtead of the grinding motion, which

* Vide Plate VII. where the Symphyſis of the Lower-Jaw, when the mouth is ſhut, projects conſiderably farther forwards than that of the Upper.

would

would be uſeleſs, where there are no Grinders; they bruiſe their food rather by a ſimple motion of the Jaw upwards and downwards.

It is from the want of Teeth in both thoſe ages, that the face is ſhorter in proportion to its breadth. In an old perſon, after the Teeth are gone, the face is ſhorter, while the mouth is ſhut, by almoſt the whole lengths of the Teeth in both Jaws; that is, about an inch and an half.

From the want of Teeth too, at both thoſe ages, the cavity of the mouth is then ſmaller; and the tongue ſeems too large and unmanageable, more eſpecially in old people. In theſe laſt we obſerved alſo, that the chin projects forwards, in proportion as the mouth is ſhut; becauſe the baſis of the Lower-Jaw (which is all that now remains) deſcribes a wider circle than the Alveolar Proceſs in younger people. The Jaws do not project ſo much forwards in a child, as in an adult; hence the face is flatter, eſpecially at the lower part. In proportion as the laſt Grinders are produced, the ſides of the curve formed by the Jaws become longer, and puſh forward the fore-part, none of the additional part paſſing backwards. The fore-part alſo continues nearly of the ſame ſize, ſo that the whole Jaw is longer in proportion to its breadth, and projects farther forwards.

OF THE

FORMATION of the ALVEOLAR PROCESS.

HAVING conſidered the Alveolar Proceſſes in their adult, or perfect ſtate, we ſhall next examine and trace them from their beginning.

We obſerve the beginning of the Alveolar Proceſs at a very early period. In a fœtus of three or four months it is only a longitudinal groove, deeper and narrower forwards, and becoming gradually more ſhallow and wider backwards: inſtead of bony partitions, dividing that groove into a number of ſockets, there are only ſlight ridges acroſs the bottom and ſides, with intermediate depreſſions, which mark the future *Alveoli* *.

In the Lower-Jaw the veſſels and nerves run along the bottom of this Alveolar cavity, in a ſlight groove, which afterwards becomes a complete and diſtinct bony canal.

* Vide Plate VIII. Fig. 1, 2.

The Alveolar Proceſs grows with the Teeth, and for ſome time keeps the ſtart of them. The ridges which are to make the partitions ſhoot from the ſides acroſs the canal, at the mouth of the cell, forming hollow arches: this change happens firſt at the anterior parts of the Jaws *. As each cell becomes deeper, its mouth alſo grows narrower, and at length is almoſt, but not quite, cloſed over the contained Tooth.

The diſpoſition for contracting the mouth of the cell, is chiefly in the outer plate of the bone, which occaſions the contracted orifices of the cells to be nearer the inner edge of the Jaw. The reaſon, perhaps, why the bone ſhoots over, and almoſt covers the Tooth, is that the Gum may be firmly ſupported before the Teeth have come through.

The *Alveoli* which belong to the adult Grinders, are formed in another manner; in the Lower-Jaw they would ſeem to be the remains of the root of the Coronoid Proceſs ‡; for the cells are formed for thoſe Teeth in the root of that Proceſs; and in proportion as the body of the bone, and the cells already formed, puſh forwards from under that Proceſs, the ſucceeding cells and their Teeth are formed, and puſhed forward in the ſame manner.

* Vide Plate VIII. Fig. 1, 2, 3, 4, 5, and 6.

† Vide Plate VIII. Fig. 7, which is moſt remarkable in thoſe of the Grinders; as theſe Alveoli are not opened for the exit of the Teeth.

‡ Vide Plate X. Fig 1.

In the Upper-Jaw there are cells formed in the tubercles for the young Grinders, which at firſt are very ſhallow, and become deeper and deeper as the Teeth grow; and they grow ſomewhat faſter, ſo as almoſt to incloſe the whole Tooth before it is ready to puſh its way through that incloſure and Gum *. There is a ſucceſſion of theſe, till the whole three Grinders are formed.

* Vide Plate I. Fig. 10.

FORMATION of the TEETH in the FOETUS.

THE depreſſion, or firſt rudiments of the *Alveoli* obſervable in a Fœtus of three or four months, is filled with four or five little pulpy ſubſtances, which are not very diſtinct at this age. About the fifth month both the proceſſes themſelves and the pulpy ſubſtances become more diſtinct; the anterior of which are the moſt complete. About this age too the oſſifications begin on the edge of the firſt *Inciſores*. The *Cuſpidati* are not in the ſame circular line with the reſt, but ſomewhat on the outſide, making a projection there at this age, there not being ſufficient room for them.

In the ſixth, or ſeventh month, the edges, or tips, of all theſe five ſubſtances are begun to oſſify, and the firſt of them is a little advanced *; and beſides theſe, the pulp of the ſixth Tooth has begun to be formed; it is ſituated in the tubercle of the Upper-

* Vide Plate X. Fig. 4, 5, where theſe oſſifications are repreſented.

Jaw, and under and on the inſide of the Coronoid Proceſs in the Lower-Jaw: ſo that at this age, in both Jaws, there are in all twenty Teeth begun to oſſify, and the *ſtamina* of twenty-four. They may be divided into the *Inciſores*, *Cuſpidati*, and *Molares*; for at this age there are no *Bicuſpides*, the two laſt teeth in each ſide of both Jaws having all the characteriſtics, and anſwering all the purpoſes of the true *Molares* in the adult, though when theſe firſt *Molares* fall out, their places are taken by the *Bicuſpides*.

The Teeth gradually advance in their oſſification, and about the ſeventh, eighth, or ninth month after birth, the *Inciſores* begin to cut or paſs through the Gums; firſt, generally, in the Lower-Jaw. Before this time the oſſificationsin the third Grinder, or that which makes the firſt in the adult, are begun *.

The *Cuſpidatus* and *Molares* of the Fœtus are not formed ſo faſt as the *Inciſores*; they generally all appear nearly about the ſame time, viz. about the twentieth, or twenty-fourth month; however, the firſt Grinder is often more advanced within the ſocket than the *Cuſpidatus*, and moſt commonly appears before it.

* Vide Plate X. Fig. 6, where the firſt Inciſors had cut the Gum, and where the third Grinder in the child, or firſt in the adult, was begun to oſſify.

Theſe

Theſe twenty are the only Teeth that are of uſe to the child from the ſeventh, eighth, or ninth month, till the twelfth or fourteenth year. Theſe are called the Temporary, or Milk Teeth, becauſe they are all ſhed between the years of ſeven and fourteeen, and are ſupplied by others.

OF THE

CAUSE of PAIN in DENTITION.

THESE twenty Teeth, in cutting the Gum, give pain, and produce many other ſymptoms which often prove fatal to children in Dentition. It has been gerally ſuppoſed that theſe ſymptoms ariſe from the Tooth's preſſing upon the inſide of the Gum, and working its way mechanically; but the following obſervations ſeem to be nearer the truth.

The Teeth, when they begin to preſs againſt the Gum, irritate it, and commonly give pain. The Gums are then affected with heat, ſwelling, redneſs, and the other ſymptoms of inflammation. The Gum is not cut through by ſimple or mechanical preſſure, but the irritation and conſequent inflammation produces a thinning, or waſting of the Gum at this part: for it often happens that when an extraneous, or a dead ſubſtance, is contained in the body, that it produces a deſtruction of the part between it, and that part of the ſkin which is neareſt it, and ſeldom of the other parts, excepting thoſe between it and the ſurface of a cavity opening externally, and that by no means ſo frequently;

quently. And in thoſe caſes there is an abſorption of the ſolids, or of the part deſtroyed, not a melting down, or ſolution of them into Pus. The Teeth are to be looked upon as extraneous bodies, with reſpect to the Gum, and as ſuch they irritate the inſide of that part in the ſame manner as the Pus of an abſceſs, an exfoliation of a bone, or any other extraneous body; and therefore produce the ſame ſymptoms, excepting only the formation of matter. If, therefore, theſe ſymptoms attend the cutting of the Teeth, there can be no doubt of the propriety of opening the way for them; nor is it ever, as far as I have obſerved, attended with any dangerous conſequence.

OF THE

FORMATION and PROGRESS of the ADULT TEETH.

HAVING now conſidered the firſt formation, and the progreſs of the Temporary Teeth, we ſhall next deſcribe the formation of thoſe Teeth which are to ſerve through life.

In this enquiry, to avoid confuſion, I ſhall confine the deſcription to the Teeth in the Lower-Jaw; for the only difference between thoſe in the two Jaws, is in the time of their appearance, and generally it is later in the Upper-Jaw. Their formation and appearance proceeds not regularly from the firſt *Inciſor* backwards to the *Dens Sapientiæ*, but it begins at two points on each ſide of both Jaws, viz. at the firſt *Inciſor*, and at the firſt *Molaris*. The Teeth between theſe two points make a quicker progreſs than thoſe behind.

The Pulp of the firſt adult *Inciſor*, and of the firſt adult *Molaris* begin to appear in a Fœtus of ſeven or eight months, and five or ſix months after birth the offification

cation begins in them; ſoon after birth the Pulp of the ſecond *Inciſor* and *Cuſpidatus* begin to be formed, and about eight or nine months afterwards they begin to oſſify; about the fifth or ſixth year the firſt *Bicuſpis* appears; about the ſixth or ſeventh the ſecond *Bicuſpis*, and the ſecond *Molaris*; and about the twelfth, the third *Molaris*, or *Dens Sapientiæ*.

The firſt five may be called the permanent Teeth: they differ from the temporary in having larger fangs. The permanent *Inciſores* and *Cuſpidati* are much thicker and broader, and the *Molares* are ſucceeded by *Bicuſpides*, which are ſmaller, and have but one fang.

All theſe permanent or ſucceeding Teeth are formed in diſtinct *Alveoli* of their own; ſo that they do not fill up the old ſockets of the temporary Teeth, but have their new *Alveoli* formed as the old *ones* decay *.

The firſt *Inciſor* is placed on the inſide of the root of the correſponding temporary Tooth, and deeper in the Jaw. The ſecond *Inciſor* and the *Cuſpidatus* begin to be formed on the inſide, and ſomewhat under the temporary ſecond *Inciſor* and *Cuſpidatus*. Theſe three are all ſituated much in the ſame manner, with reſpect to the firſt ſet; but as they are larger, they are placed ſomewhat farther back in the circle of the Jaw.

* Vide Plate X. Fig. 1, 2, and 3.

The firſt *Bicuſpis* is placed under, and ſomewhat farther back than the firſt temporary Grinder, or fourth Tooth of the child.

The ſecond *Bicuſpis* is placed immediately under the ſecond temporary Grinder.

The ſecond *Molaris* is ſituated in the lengthening tubercle in the Upper-Jaw, and directly under the Coronoid Proceſs in the Lower.

The third *Molaris*, or *Dens Sapientiæ*, begins to form immediately under the Coronoid Proceſs.

The firſt Adult *Molaris* comes to perfection, and cuts the Gum about the twelfth year of age, the ſecond about the eighteenth, and the third, or *Dens Sapientiæ*, from the twentieth to the thirtieth: ſo that the *Inciſores* and *Cuſpidati* require about ſix or ſeven years, from their firſt appearance, to come to perfection; the *Bicuſpides* about ſeven or eight; and the *Molares* about twelve.

It ſometimes happens that a third ſet of Teeth appears in very old people; when this does happen, it is in a very irregular manner, ſometimes only one, at other times more, and now and then a complete ſet comes in both Jaws. I never ſaw an inſtance of this kind

kind but once, and there two fore Teeth ſhot up in the Lower-Jaw.

I ſhould ſuppoſe that a new Alveolar Proceſs muſt be alſo formed in ſuch caſes, in the ſame manner as in the production of the firſt and ſecond ſets of Teeth. From what I can learn, the age at which this happens is generally about ſeventy. From this circumſtance, and another that ſometimes happens to women at this age, it would appear that there is ſome effort in nature to renew the body at that period.

When this ſet of Teeth which happens ſo late in life, is not complete, eſpecially where they come in one Jaw, and not in the other, they are rather hurtful than uſeful; for in that caſe we are obliged to pull them out, as they only wound the oppoſite Gum.

THE

MANNER in which a TOOTH is formed.

THE body of the Tooth is formed firſt, afterwards the Enamel and Fangs are added to it. All the Teeth are produced from a kind of pulpy ſubſtance, which is pretty firm in its texture, tranſparent, excepting at the ſurface, where it adheres to the Jaw, and has at firſt the ſhape of the bodies of the Teeth which are to be formed from it *. Theſe pulpy ſubſtances are very vaſcular, they adhere only at one part to the Jaw, viz. at the bottom of the cavity which is to form the ſocket; and at that place their veſſels enter; ſo that they are prominent, and ſomewhat looſe in the bony cavity which lodges them.

They grow nearly as large as the body of the Tooth before the oſſification begins, and increaſe a little for ſome time after the oſſification is begun. They are ſurrounded by a membrane, which is not connected with them, excepting at their root or ſurface of adheſion.

* Vide Plate XII. Fig. 4, 5, 6.

This membrane adheres by its outer ſurface all around the bony cavity in the Jaw, and alſo to the gum where it covers the Alveoli.

When the pulp is very young, as in the Fœtus of ſix or ſeven months, this membrane itſelf is pretty thick and gelatinous *. We can examine it beſt in a new-born child, and we find it made up of two *lamellæ*, an external and internal: the external is ſoft and ſpongy, without any veſſels; the other is much firmer, and extremely vaſcular, its veſſels coming from thoſe that are going to the pulp of the Tooth: it makes a kind of Capſula for the pulp and body of the Tooth. While the Tooth is within the gum, there is always a mucilaginous fluid, like the Sinovia in the joints, between this membrane and the pulp of the Tooth.

When the Tooth cuts the gum, this membrane likewiſe is perforated; after which it begins to waſte, and entirely gone by the time the Tooth is fully formed, for the lower part of the membrane continues to adhere to the neck of the Tooth, which has now riſen as high as the edge of the gum.

* Vide Plate XII. Fig. 1, 2.

OF THE

OSSIFICATION of a TOOTH upon the PULP.

THE beginning of the offification upon the pulp is by one point, or more, according to the kind of Tooth. In the *Inciſores* it is generally by three points, the middle one being the higheſt, and the firſt that begins to offify. The *Cuſpidatus* begins by one point only; the *Bicuſpis* by two, one external, which is the firſt and the higheſt, and the other internal. The *Molares*, either in a child, or an adult, begin by four or five offifications, one on each point, the external always the firſt *. Where the Teeth began to offify at one point only, that offification gradually advances till the Tooth is entirely completed †; but if there are more than one point of offification, each offification increaſes till their baſis come in contact with one another, and there all unite into one ‡; after which they advance in growth as one offification.

* Vide Plate X. Fig. 4, where ſome of the diſtinct offifications may be obſerved.

† Vide Plate XIII. Fig. 1, 2, 3, &c.

‡ Vide Plate X. Fig. 5.

The offifications in their progrefs become thicker and thicker where they firft began, but increafe fafter on the edges of the Teeth; fo as thence to become more and more hollow, and the cavity becomes deeper *. As the offification advances, it gradually furrounds the Pulp till the whole is covered by bone, excepting the under furface: and while the offifications advance, that part of the Pulp which is covered by bone is always more vafcular than the part which is not yet covered †.

The adhefion of the Pulp to the new-formed Tooth, or bone, is very flight, for it can always be feparated from it without any apparent violence, nor are there any veffels going from the one to the other; the place, however, where it is moft ftrongly attached is round the edge of the bony part, which is the laft part formed. When the bone has covered all the Pulp, it begins to contract a little, and becomes fomewhat rounded, making that part of the Tooth which is called the neck; and from this place the fangs begin ‡. When the fangs form, they puſh up the bodies of the Teeth through the fockets, which waſte, and afterwards through the Gum, which

* Vide Plate XIII. Fig. *a*, *b*, *c*, *d*, two rows of Inciſors ſawed down the middle, the higheſt of the child, the other of the adult; *c*, *f*, *g*, two rows of Grinders ſhewing the ſame circumſtances.

† Vide Plate XII. Fig. 5, 6.

‡ Vide Plate XIII. Fig 1. 2, 3, &c.

alſo waſtes, as has been explained upon the cutting of the Teeth; for before this time the riſing of the Teeth is ſcarce obſervable, as the Pulp was at firſt nearly of the ſize of the body of the Tooth itſelf, and waſted nearly in proportion to the increaſe of the whole oſſification.

The Pulp has originally no proceſs anſwering to the fang *; but as the cavity in the body of the Tooth is filled up by the oſſification, the pulp is lengthened into a fang. The fang grows in length, and riſes higher and higher in the ſocket, till the whole body of the Tooth is puſhed out. The ſocket, at the ſame time, contracts at its bottom, and graſps the neck, or beginning fang, adheres to it, and riſes with it, which contraction is continued through the whole length of the ſocket as the fang riſes; or the ſocket which contained the body of the Tooth, being too large for the fang, is waſted or abſorbed into the conſtitution, and a new Alveolar portion is raiſed with the fang; whence in reality the fang does not ſink, or deſcend into the Jaw. Both in the body, and in the fang of a growing Tooth, the extreme edge of the oſſification is ſo thin, tranſparent, and flexible, that it would appear rather to be horny than bony, very much like the mouth or edge of the ſhell of a ſnail when it is growing: and indeed it would

* Vide Plate XII. Fig. 1, 4, 5, and 6.

ſeem

ſeem to grow much in the ſame manner*, and the oſſified part of a Tooth would ſeem to have much the ſame connection with the pulp as a ſnail has with its ſhell.

As the Tooth grows, its cavity becomes gradually ſmaller, eſpecially towards the point of the fang. In tracing the formation of the fang of a Tooth, we hitherto have been ſuppoſing it to be ſingle, but where there are two, or more, it is ſomewhat different, and more complicated.

When the body of a Molares is formed, there is but one general cavity in the body of the Tooth, from the brim of which the oſſification is to ſhoot, ſo as to form two or three fangs †. If two only, then the oppoſite parts of the brim of the cavity of the Tooth ſhoot acroſs where the Pulp adheres to the Jaw, meet in the middle, and thereby divide the mouth of the cavity into two openings ‡; and from the edges of theſe two openings the two fangs grow §.

We often find that a diſtinct oſſification begins in the middle of the general cavity upon the root of the

* Vide Plate XIII. Fig. 1, 2, 3, or Fig.
† Vide Plate XIII. Fig. 1, *a a*.
‡ Vide Plate XIII. Fig. *b*.
§ Vide Plate XIII. Fig. *c d e*.

Pulp, and two proceſſes coming from the oppoſite edges of the bony ſhell join it; which anſwers the ſame purpoſe.

When there are three fangs, we ſee three proceſſes coming from ſo many points of the brim of the cavity, which meet in the center, and divide the whole into three openings *; and from theſe are formed the three fangs †. We often find the fangs forked at their points, eſpecially in the *Bicuſpides*. In this caſe, the ſides of the fang as it grows, come cloſe together in the middle, making a longitudinal groove on the outſide; and this union of the oppoſite ſides divides the mouth of the growing fang into two orifices, from which the two points are formed.

By the obſervations which I have made in unravelling the texture of the Teeth, when ſoftened by an acid, and from obſerving the diſpoſition of the red parts in the Tooth of growing animals, interruptedly fed with madder, I find that the bony part of a Tooth is formed of *Lamellæ*, placed one within another. The outer *Lamellæ* is the firſt formed, and is the ſhorteſt: the more internal *Lamellæ* lengthen gradually towards the fang, by which means, in proportion as the Tooth

* Vide Plate XIII. Fig. *f*, *g*.

† Vide Plate XIII. Fig. *h*, *i*, *k*.

grows

grows longer, its cavity grows ſmaller, and its ſides grow thicker *.

How the earthy and animal ſubſtance of the Tooth is depoſited on the ſurface of the pulp is not perhaps to be explained.

* Vide Plate XII. Fig. 7, 8.

OF THE

FORMATION of the ENAMEL.

IN ſpeaking of the Enamel we poſtponed treating of its Formation, till it could be more clearly underſtood; and now we ſhall previouſly deſcribe ſome parts which we apprehend to be ſubſervient to its formation, much in the ſame manner as the Pulp is to the body of the Tooth.

From its ſituation, and from the manner in which the Teeth grow, one would imagine that the Enamel is firſt formed; but the bony part begins firſt, and very ſoon after the Enamel is formed upon it. There is another pulpy ſubſtance oppoſite to that which we have deſcribed; it adheres to the inſide of the Capſula, where the Gum is joined to it, and its oppoſite ſurface lies in contact with the baſis of the above deſcribed Pulp, and afterwards with the new formed baſis of the Tooth: whatever eminences or cavities the one has, the other has the ſame, but reverſed, ſo that they are moulded exactly to each other.

In

In the *Inciſores* it lies in contact not with the ſharper cutting edge of the Pulp, or Tooth, but againſt the hollowed inſide of the Tooth; and in the *Molares* it is placed directly againſt their baſe, like a Tooth of the oppoſite Jaw. It is thinner than the other Pulp, and decreaſes in proportion as the Teeth advance. It does not ſeem to be very vaſcular. The beſt time for examining it is in a Fœtus of ſeven or eight months old.

In the granivorous animal, ſuch as the horſe, cow, &c. whoſe Teeth have the Enamel intermixed with the bony part *, and whoſe Teeth, when forming, have as many interſtices as there are continuations of the Enamel, we find proceſſes from the Pulp paſſing down into thoſe interſtices as far as the Pulp which the Tooth is formed from, and there coming into contact with it.

After the points of the firſt deſcribed Pulp are begun to oſſify, a thin covering of enamel is ſpread over them, which increaſes in thickneſs till ſome time before the Tooth begins to cut the Gum.

The Enamel appears to be ſecreted from the Pulp above deſcribed, and perhaps from the Capſula which incloſes the body of the Tooth. That it is from the Pulp and Capſula ſeems evident in the horſe, aſs, ox, ſheep, &c. therefore we have little reaſon to doubt of

* Vide Plate XIV. Fig. 19, 20.

it in the human ſpecies. It is a calcareous earth, probably diſſolved in the juices of our body, and thrown out from theſe parts which act here as a gland. After it is ſecreted, the earth is attracted by the bony part of the Tooth, which is already formed; and upon that ſurface it cryſtallizes.

The operation is ſimilar to the formation of the ſhell of the egg, the ſtone in the kidneys and bladder, and the gall ſtone. This accounts for the ſtriated cryſtallized appearance which the Enamel has when broken, and alſo for the direction of theſe *Striæ* *.

The Enamel is thicker at the points and baſis than at the neck of the Teeth, which may be eaſily accounted for from its manner of formation; for if we ſuppoſe it to be always ſecreting, and laid equally over the whole ſurface, as the Tooth grows, the firſt formed will be the thickeſt; and the neck of the Tooth, which is the laſt formed part incloſed in this Capſula, muſt have the thinneſt coat; and the fang, where the *Perioſteum* adheres, and leaves no vacant ſpace, will have none of the Enamel.

* The Author has made many experiments on the formation of different *Calculi*, and finds they are formed by cryſtallization, which were communicated to his brother, and taught by him to his pupils in 1761, and which he propoſes to give to the Public as ſoon as his time will permit.

At

At its firſt formation it is not very hard; for by expoſing a very young Tooth to the air, the Enamel cracks, and looks rough: but by the time that the Teeth cut the Gum, the Enamel ſeems to be as hard as ever it is afterward; ſo that the air ſeems to have no effect in hardening it.

OF THE

MANNER of SHEDDING of TEETH.

AN opinion has commonly prevailed, that the firſt ſet of Teeth are puſhed out by the ſecond; this, however, is very far from being the caſe: and were it ſo, it would be attended with a very obvious inconvenience; for, were a Tooth puſhed out by one underneath, that Tooth muſt riſe in proportion to the growth of the ſucceeding one, and ſtand in the ſame proportion above the reſt. But this circumſtance never happens: neither can it; for, the ſucceeding Teeth are formed in new and diſtinct ſockets, and generally the *Inciſores* and the *Cuſpidati* of the ſecond ſet are ſituated on the inſide of the correſponding teeth of the firſt ſet *; and we find, that in proportion to the growth of the ſucceeding Teeth, the fangs of the firſt ſet decay, till the whole of the fang is ſo far deſtroyed, that nothing remains but the neck, or that part of the fang to which the Gum adheres †, and then the leaſt force puſhes the Tooth out. It would be very natural to ſuppoſe, that this

* Vide Plate X. Fig. 2, 3.

* Vide Plate XV. which ſhews the gradual decay in the ſingle and double Teeth, and alſo in one Grinder of a horſe.

was

was owing to a conſtant preſſure from the riſing Teeth againſt the fangs or ſockets of the firſt ſet: but it is not ſo; for, the new Alveoli riſe with the new Teeth, and the old Alveoli decay in proportion as the fangs of the old Teeth decay, and when the firſt ſet falls out, the ſucceeding Teeth are ſo far from having deſtroyed, by their preſſure, the parts againſt which they might be ſuppoſed to puſh, that they are ſtill incloſed, and covered by a complete bony ſocket. From this we ſee, that the change is not produced by a mechanical preſſure, but is a particular proceſs in the animal œconomy.

I have ſeen two or three Jaws where the ſecond temporary Grinders were ſhedding in the common way, without any Tooth underneath; and in one Jaw, where both the Grinders were ſhedding, I met with the ſame circumſtance.

A remarkable inſtance of this ſort occurred to me in a lady who deſired me to look at a looſe Tooth, which I found was the laſt temporary Tooth not yet ſhed. I deſired that it might be drawn out, and told her it was of no uſe, and could not by any art be fixed, as it was one of the Teeth that is naturally ſhed, and that another might come in its place: however ſhe was diſappointed.

Theſe caſes prove evidently, that in ſhedding, the firſt Teeth are not puſhed out by the ſecond ſet, but that they grow looſe, and fall out of their own accord. That the ſucceeding Teeth have ſome influence on the ſhedding of the temporary ſet is proved by thoſe very caſes; ſince in one of the firſt mentioned the perſon was above twenty years of age, and in the other the lady was thirty; and it is reaſonable to believe, that the ſhedding of theſe Teeth was ſo late in thoſe inſtances, from the want of the influence, whatever it is, of the new Teeth. When the *Inciſores* and *Cuſpidati* of the new ſet are a little advanced, but long before they appear through their bony ſockets, there are ſmall holes leading to them on the inſide, or behind the temporary ſockets and Teeth; and theſe holes grow larger and larger, till at laſt the body of the Tooth paſſes quite through them.

OF THE

GROWTH of the TWO JAWS.

AS a knowledge of the manner in which the two Jaws grow, will lead to the better underſtanding the ſhedding of the Teeth; and as the Jaws ſeem to differ in their manner of growing, from other bones, and alſo vary according to the age, it will be here proper to give ſome account of their growth.

In a Fœtus three or four months old, we have deſcribed the marks of four or five Teeth, which occupy the whole length of the Upper-Jaw, and all that part of the Lower which lies before the Coronoid Proceſs, for the fifth Tooth is ſomewhat under that proceſs *.

Theſe five marks become larger, and the Jaw bones of courſe increaſe in all directions, but more conſiderably backwards; for in a Fœtus of ſeven or eight months, the marks of ſix Teeth in each ſide of both Jaws are to be obſerved, and the ſixth ſeems to be in the place where the fifth was; ſo that in theſe laſt four

* Vide Plate VIII. Fig. 1, 2.

months the Jaw has grown in all directions in proportion to the increaſed ſize of the Teeth, and beſides has lengthened itſelf at its poſterior end as much as the whole breadth of the ſocket of that ſixth Tooth *.

The Jaw ſtill increaſes in all points till twelve months after birth, when the bodies of all the ſix Teeth are pretty well formed; but it never after increaſes in length between the ſymphyſis and the ſixth Tooth; and from this time too, the Alveolar Proceſs, which makes the anterior part of the arches of both Jaws, never becomes a ſection of a larger circle, whence the lower part of a child's face is flatter, or not ſo projecting forwards as in the adult†.

After this time the Jaws lengthen only at their poſterior ends; ſo that the ſixth Tooth, which was under the Coronoid Proceſs in the Lower-Jaw, and in the tubercles of the Upper-Jaw of the Fœtus, is at laſt, *viz.* in the eighth or ninth year, placed before theſe parts; and then the ſeventh Tooth appears in the place which the ſixth occupied, with reſpect to the Coronoid Proceſs, and tubercle; and about the twelfth or fourteenth year, the eighth Tooth is ſituated where the ſeventh was placed.

* Vide Plate VIII. Fig. 3, 4, 5, 6, for the general increaſe of the Jaws, but more particularly backwards.

† Vide Plate VIII. Fig. 7, for theſe facts.

At

At the age of eighteen, or twenty, the eighth Tooth is found before the Coronoid Proceſs in the Lower-Jaw, and under, or ſomewhat before the tubercle in the Upper-Jaw, which tubercle is no more than a ſucceſſion of ſockets for the Teeth till they are completely formed.

In a young child the cavity in the temporal bone for the articulation of the Jaw is nearly in a line with the Gums of the Upper-Jaw; and for this reaſon the Condyle of the Lower-Jaw is nearly in the ſame line *; but afterwards, by the addition of the Alveolar Proceſs and Teeth, the line of the Gums in the Upper-Jaw deſcends conſiderably below the articular cavity; and for that reaſon the Condyloid Proceſs is then lengthened in the ſame proportion.

In old people who have loſt all their Teeth, the articulation comes again into the ſame line with the Gums of the Upper-Jaw †; but in the Lower-Jaw, the Condyles cannot be diminiſhed again for accommodating it to the Upper, ſo that it neceſſarily projects beyond the Gums of the Upper-Jaw at the fore-part. When the mouth is ſhut, the projection of the Jaw at the chin, fits the two Jaws to each other at that place

* Vide Plate VIII. Fig. 11.

† Vide Plate VII.

where

where the Grinders were ſituated, and where the ſtrength of maſtication lies ; for if the chin was not further from the center of motion than the Gums of the Upper-Jaw, at the fore part, the Jaws, in ſuch people as have loſt all their Teeth, would meet in a point at the fore part, like a pair of pinchers, and be at a conſiderable diſtance behind *.

* Vide Plate VII.

THE

REASON for the SHEDDING of the TEETH.

AS the ſhedding of the Teeth is a very ſingular proceſs in the animal œconomy, many reaſons have been aſſigned for it; but theſe reaſons have not carried along with them that conviction which is deſired. Authors have not fully conſidered the appearances which naturally explain themſelves; nor have they conſidered the advantages neceſſarily ariſing from the ſize and conſtruction of only ſuch a number as the firſt ſet; nor have they conſidered fully the diſadvantages that ſuch ſize and conſtruction would have, if continued when it is neceſſary to have a greater number, which is the caſe with the adult.

We ſhall conſider theſe advantages in a child where the ſhedding Teeth are all completely formed, which will be ſetting them in the cleareſt point of light; and alſo, the diſadvantages that would occur, if in the adult theſe were not changed for another ſet ſomewhat different.

If the child had been ſo contrived, as not to have required Teeth till the time of the ſecond ſet's appearing, there would have been no occaſion for a new ſet: but the Jaw-bones being conſiderably ſmaller in children than in adults, and it being neceſſary that they ſhould have two Grinders, there is not room for *Inciſores* and *Cuſpidati* of ſufficient ſize to ſerve through life; and the firſt formed Grinders having neceſſarily too ſmall fangs, and the Jaw increaſing at the back part only, theſe two Grinders would have been protruded too far forwards, and at too great a diſtance from the center of motion. This variation in the ſize of the Teeth is likewiſe a reaſon why the ſecond ſet are not formed in the ſockets of the firſt; and why the old ſockets are deſtroyed.

Theſe circumſtances with regard to the ſhedding of the Teeth, contradict the notion of the ſecond ſet being made broader and thicker, by the reſiſtance they meet with in puſhing out the firſt. For were we, on a partial view of the ſubject, to admit the ſuppoſition, the *Bicuſpides* would effectually overturn our hypotheſis; becauſe here the ſecond ſet are much ſmaller than the firſt, and yet the reſiſtance would be greater to them than to the *Inciſores*.

From the manner in which the Teeth are ſhed, it is evident that drawing a temporary Tooth, for the eaſier pro-

protruſion of the one underneath, will be of no great ſervice; for in general it falls out before the other can touch it. But it is often of much more ſervice to pull out the neighbouring, or adjacent temporary Tooth; for we muſt be convinced by what has been advanced with regard to the changes in ſize, that excepting the whole were to ſhed at the ſame time, or the order of ſhedding, viz. from before backwards, were to be inverted, that the ſecond ſet of *Inciſores* and *Cuſpidati* muſt be pinched in room, till the Grinders are alſo ſhed: and therefore we find it often of uſe to draw a temporary Tooth, that is placed further back; and it would, perhaps, be right upon the whole, always to draw, at leaſt the firſt Grinder; and, perhaps, ſome time after, the ſecond Grinder alſo.

OF THE

CAVITY filling up as the TEETH wear down.

A TOOTH very often wears down ſo low, that its cavity would be expoſed, if no other alteration were produced in it. To prevent this, nature has taken care that the bottom part of the cavity ſhould be filled up by new matter, in proportion as the ſurface of the Teeth is worn down. This new matter may be eaſily known from the old; for when a Tooth has been worn down almoſt to the neck, a ſpot may always be ſeen in the middle, which is more tranſparent, and at the ſame time of a darker colour, (occaſioned, in ſome meaſure, by the dark cavity under it) and is generally ſofter than the other *. Any perſon may be convinced of the truth of theſe obſervations, by taking two Teeth of the ſame claſs, but of very different ages, one juſt completely formed, the other worn down almoſt to its neck. In the laſt he will obſerve the dark ſpot in the center; and if as much is cut off from the complete

* Vide Plate XIV. Fig. 24, 25.

Tooth

Tooth as hath been worn off the old one, the cavity of the young Tooth will be found cut through; and on examining the other, its cavity will be found filled up below that ſurface. Now this obſervation contradicts the idea of the hole leading into the cavity of the Tooth being cloſed up; and what is ſtill a further proof of it, I have been able to inject veſſels in the cavities of the Teeth in very old people when the Alveolar Proceſs has been gone, and the Teeth very looſe in the Gum.

Old people are often found to have very good ſets of Teeth, only pretty much worn down. The reaſon of this is, that ſuch people never had any diſorder in their Teeth, or Alveolar Proceſſes, ſufficient to occaſion the falling of one Tooth. For if by accident one Tooth is loſt, the reſt will neceſſarily fail in ſome degree, even though they are ſound, and likely to remain ſo, had not this accident happened; and this weakening cauſe is greater, in proportion to the number that are loſt. From this obſervation, we ſee that the Teeth ſupport one another.

OF THE

CONTINUAL GROWTH of the TEETH.

IT has been aſſerted that the Teeth are continually growing, and that the abraſion is ſufficient to keep them always of the ſame length; but we find that they grow at once to their full length, and that they gradually wear down afterwards; and that there is not even the appearance of their continuing to grow. The Teeth would probably project a little farther out of the Gum, if they were not oppoſed by thoſe in the oppoſite Jaw; for in young people, who had loſt a Tooth before the reſt had come to their full length, I have ſeen the oppoſite Tooth project a little beyond the reſt, before they were at all worn down. It may be further obſerved, that when a Tooth is loſt, the oppoſite one may project from the diſpoſition of the Alveolar Proceſs to riſe higher, and fill up at the bottom of the ſockets; and the want of that natural preſſure ſeems to give that diſpoſition to theſe proceſſes, which is beſt illuſtrated in thoſe Teeth which are formed deeper in their ſockets than uſual. As a proof that the Teeth continue growing, it has been ſaid that the ſpace

of

of a fallen Tooth is almoſt filled up by the increaſed thickneſs of the two adjacent Teeth, and the lengthening of that which is oppoſite. There is an evident fallacy in the caſe; either the obſervations have been made upon ſuch Jaws as above deſcribed, or the appearances have not been examined with ſufficient accuracy; for when the ſpace appears to have become narrow by the approximation of the two adjacent Teeth, it is not owing to any increaſe of their breadth, but to their moving from that ſide where they are well ſupported, to the other ſide, where they are not. For this reaſon they get an inclined direction; and I obſerve it extends to the ſeveral adjacent Teeth in a proportional leſs degree, and affects thoſe which are behind *, more than thoſe which are before the vacant ſpace.

In the Lower-Jaw the back Teeth are not fixed perpendicularly, but all inclined forward; and the depreſſion of the Jaw increaſes this poſition: the action of the Teeth, when thrown out of the perpendicular, has alſo a tendency to increaſe that oblique direction, as a pair of ſciſſars, in cutting, puſhes every thing forward, or from the center of motion: therefore this alteration, I think, is moſt commonly obſervable in the Lower-Jaw.

* Vide Plate XVI. Fig. 1, *b*, *c*.

And that Teeth are not actually always growing in breadth, muſt be obvious to every perſon who conſiders, that in many people, through life, the Teeth ſtand ſo wide from each other, that there are conſiderable ſpaces between them; which could not be the caſe if they were always growing in thickneſs.

We might add too, that according to the hypotheſis, the *Dens Sapientiæ* ſhould grow to an enormous ſize backward, becauſe there it has no check from preſſure; and in people where the *Dens Sapientiæ* is wanting in one Jaw, which is very common, it ſhould grow to an uncommon length in the oppoſite Jaw, for the ſame reaſon. But neither of theſe things happens.

I need hardly take notice, that when a Tooth has loſt its oppoſite, it will in time become really ſo much longer than the reſt, as the others grow ſhorter by abraſion; and I obſerve that the Tooth which is oppoſite to the empty ſpace, becomes in time not only longer for the above-mentioned reaſon, but more pointed. The apex falls into the void ſpace, and the two ſides are rubbed away againſt the ſides of the two approaching Teeth next to that ſpace.

The manner of their formation likewiſe ſhews that Teeth cannot grow beyond a certain limited ſize. To illuſtrate this I may obſerve, that I have often, in the

the dead body of adults, found the left *Cuſpidatus* of the Upper-Jaw, with its points ſcarcely protruding out of the Alveolar Proceſs, though the Tooth was completely formed, and longer than the other by the whole point, which in that other was worn away *. This Tooth, at its firſt formation, had been deeper in the Jaw than what is common; and after it had grown to the ordinary ſize, it grew no longer, though it had not the reſiſtance of the oppoſite Teeth to ſet bounds to its increaſe: yet commonly in theſe caſes the Tooth continues to project further and further through the Gum; though this is not owing to its growing longer, but to the ſocket filling up behind it, and thereby continuing to puſh it out by ſlow degrees.

* Vide Plate VIII. Fig. 8.

OF THE

SENSIBILITY of TEETH.

THE Teeth would ſeem to be very ſenſible; for they appear to be ſubject to great pain, and are eaſily and quickly affected by either heat or cold.

We may preſume that the bony ſubſtance itſelf, is not capable of conveying ſenſations to the mind, becauſe it is worn down in maſtication, and occaſionally worked upon by operators in living bodies, without giving any ſenſation of pain in the part itſelf.

In the cavity of a Tooth it is well known that there is exquiſite ſenſibility; and it is likewiſe believed, that this is owing to the nerve in that cavity. This nerve would ſeem to be more ſenſible than nerves are in common; as we do not obſerve the ſame violent effects from any other nerve in the body being expoſed either by wound, or ſore, as we do from the expoſure of the nerve of a Tooth. Perhaps the reaſon of the intenſeneſs, as well as the quickneſs of the ſenſe of heat and cold in the Teeth, may be owing to their communicating theſe to the nerve ſooner than any other part of the body.

OF

SUPERNUMERARY TEETH.

WE often meet with Supernumerary Teeth; and this, as well as ſome other variations, happens oftener in the Upper than in the Lower-Jaw, and, I believe, always in the *Inciſores* and *Cuſpidati*. I have only met with one inſtance of this ſort, and it was in the Upper-Jaw of a child about nine months old: there were the bodies of two Teeth, in ſhape like the *Cuſpidati*, placed directly behind the bodies of the two firſt permanent *Inciſores*; ſo that there were three Teeth in a row, placed behind one another, viz. the temporary *Inciſor*, the body of the permanent *Inciſor*, and that ſupernumerary Tooth. The moſt remarkable circumſtance was, that theſe Supernumerary Teeth were inverted, their points being turned upwards, and bended by the bone which was above them not giving way to their growth, as the Alveolar Proceſs does.

It often happens that the *Inciſores* and *Cuſpidati*, in the Upper-Jaw eſpecially, are ſo irregularly placed, as to give the appearance of a double row. I once ſaw a remarkable inſtance of this in a boy; the ſecond *In-*

ciſor in each ſide was placed farther back than what is common, and the *Cuſpidatus* and firſt *Inciſor* cloſer together, than if the ſecond *Inciſor* had been directly between them; ſo that the appearance gave an idea of a ſecond row of Teeth.

This happens only in the adult ſet of Teeth, and is owing to there not being room in the Jaw for this ſecond ſet, the Jaw-Bone being formed with the firſt ſet of Teeth, and never increaſing afterwards; ſo that if the adult ſet does not paſs further back, they muſt over-lap each other, and give the appearance of a ſecond row.

OF THE

USE of the TEETH ſo far as they affect the VOICE.

THE Teeth ſerve principally for maſtication; and that uſe need not be farther explained.

They ſerve likewiſe a ſecondary, or ſubordinate purpoſe; giving ſtrength and clearneſs to the ſound of the voice, as is evident from the alteration produced in ſpeaking, when the Teeth are loſt.

This alteration, however, may not depend entirely upon the Teeth, but, in ſome meaſure, on the other organs of the voice having been accuſtomed to them; and therefore when they are gone, thoſe other organs may be put out of their common play, and may not be able to adapt themſelves ſo well to this new inſtrument. Yet I believe that habit in this caſe has no great effect; for thoſe people ſeldom or never to get the better of the defect; and young children, who are ſhedding their Teeth, and are, perhaps, without any Fore Teeth for half a year or more, always have that defect in their

voice,

voice, till the new Teeth come; and as theſe grow the voice becomes clear again.

This uſe ſeems to be entirely in the Fore Teeth; for the loſs of one of theſe makes a great alteration, and the loſs of two or three Grinders ſeems to have no ſenſible effect. As an argument for the uſe of the Teeth in modifying the ſound of the voice, we may obſerve, that the Fore Teeth come at a time when the child begins to articulate ſounds, and at that time they are ſo looſe in the gums, that they can be of very little ſervice in maſtication.

Every defect in ſpeech, ariſing from this defect in the organ, is generally attended with what we call a liſp. People who have loſt all their Teeth, and moſt old people for that reaſon, loſe, in a great meaſure, their voice. This ariſes partly from the loſs of the Fore Teeth, but principally from the loſs of all the Teeth, and of the Alveolar Proceſſes of both Jaws, by which means the mouth becomes too ſmall for the tongue, and the lips and cheeks become flaccid; inſomuch that the nicer movements of theſe parts, in the articulation of ſounds, are obſtructed; and thence the words and ſyllables are indiſtinctly pronounced, and ſlurred, or run into one another.

Under what CLASS do the HUMAN TEETH come.

NATURAL Hiſtorians have been at great pains to prove from the Teeth, that man is not a carnivorous animal; but in this, as in many other things, they have not been accurate in their definitions; nor have they determined what a carnivorous animal is.

If they mean an animal that catches and kills his prey with his Teeth, and eats that fleſh of the prey juſt as it is killed, they are in the right; man is not in this ſenſe a carnivorous animal, and therefore he has not Teeth like thoſe of a Lion; and this, I preſume, is what they mean.

But if their meaning were that the Human Teeth are not fitted for eating meat that has been catched, killed, and dreſſed by art, in all the various ways that the ſuperiority of the human mind can invent, they are in the wrong. Indeed, from this confined way of thinking it would be hard to ſay what the human Teeth are fitted for; becauſe, by the ſame reaſoning man is not a graminivorous animal, as his Teeth are not fitted for pulling vegetable food, &c. They are not made like thoſe of cows or horſes, for example.

The

The light in which we ought to view this ſubject is, that man is a more perfect or complicated animal than any other; and is not made like others, to come at his food by his Teeth, but by his hands, directed by his ſuperior ingenuity; the Teeth being given only for the purpoſe of chewing the food, in order to its more eaſy digeſtion: and they, as well as his other organs of digeſtion, are fitted for the converſion of both animal and vegetable ſubſtances into blood; and thence he is able to live in a much greater variety of circumſtances than any other animal, and has more opportunities of exerciſing the faculties of his mind. He ought, therefore, to be conſidered as a compound, fitted equally to live upon fleſh and upon vegetables.

OF THE

DISEASES of the TEETH.

THE Teeth are ſubject to diſeaſes as well as other parts of the body. Whatever the diſorder is that affects them, it is generally attended with pain; and from this indeed we commonly firſt know that they are affected.

Pain in the Teeth proceeds, I believe, in a great meaſure, from the air coming into contact with the nerve in the cavity of the Tooth; for we ſeldom ſee people affected with the Tooth-ach, but when the cavity is expoſed to the air.

It is not eaſy to ſay by what means the cavity comes to be expoſed.

The moſt common diſeaſe to which the Teeth are ſubject, begins with a ſmall, dark coloured ſpeck, generally on the ſide of the Tooth where it is not expoſed to preſſure; from what cauſe this ariſes is hitherto unknown. The ſubſtance of the Tooth thus diſcoloured,

gradually decays, and an opening is made into the cavity. As ſoon as the air is thereby admitted, a conſiderable degree of pain ariſes, which is probably owing to the admiſſion of the air, as it may be prevented by filling the cavity with lead, wax, &c. This pain is not always preſent; the food, and other ſubſtances, perhaps fill up the hole occaſionally, and prevent the acceſs of the air, and of conſequence the pain, during the time they remain in it. When an opening is made into the cavity of the Tooth, the inſide begins to decay, the cavity becomes larger, the breath at the ſame time often acquires a putrid *Fætor*, the bone continues to decay till it is no longer able to ſupport the preſſure of the oppoſite Tooth, it breaks and lays the cavity open. We have not as yet found any means of preventing this diſeaſe, or of curing it; all that can be done, is to fill the hole with lead, which prevents the pain, and retards the decay; but after the Tooth is broken, this is not practicable; and for that reaſon it is then beſt to extract it.

It would be beſt of all to attempt the extraction of a Tooth by drawing it in the direction of its axis: but that not being practicable by the inſtruments at preſent in uſe, which pull laterally, it is the next beſt to draw a Tooth to that ſide where the Alveolar Proceſs is weakeſt; which is the inſide, in the two laſt grinders on each ſide of the Lower-Jaw, and the outſide in all the others.

It

It generally happens in drawing a Tooth, that the Alveolar Proceſs is broken, particularly when the Grinders are extracted; but this is attended with no bad conſequences, as that part of the Alveolar Proceſs from which the Tooth was extracted always decays.

In drawing a Tooth, the patient complains of a diſagreeable jarring noiſe, which always happens when any thing grates againſt the bones of the head.

OF

CLEANING the TEETH.

FROM what was ſaid of the nature and uſe of the Enamel, it is evident, that whatever is capable of deſtroying it, muſt be hurtful; therefore all acids, gritty powders, and injudicious methods of ſcaling the Teeth are prejudicial: but ſimply ſcaling the Teeth, that is, clearing them of the ſtony concretions which frequently collect about their necks, while nothing is ſcraped off but that adventitious ſubſtance, is proper and uſeful. If not removed by art, the quantity of the ſtony matter is apt to increaſe, and to affect the gum. This matter firſt begins to form on the Tooth near to the Gum; but not in the very angle, becauſe the motion of the Gum commonly prevents the accumulation of it at this part. I have ſeen it cover not only the whole Tooth, but a great part of the Gum: in this caſe there is always an accumulation of a very putrid matter, frequently conſiderable tenderneſs and ulcera-

tion of the Gum, and ſcaling becomes abſolutely neceſſary *.

* The animal fluids, when out of the courſe of the general circulation, eſpecially when they ſtagnate in cavities, are apt to depoſit an abſorbent earth, and form concretions. This earth is ſometimes contained in the fluids; and is only depoſited; as in the formation of the ſtone in the urinary paſſages: in ſome caſes, perhaps, the fluids undergo a change, by which the earth is firſt formed, and afterwards depoſited. This depoſition takes place particularly in weakened parts, or where the circulation is languid, or where there are few arteries, ſuch as about joints and tendons; as if it were intended to ſtrengthen theſe parts, if they ſhould at any time give way; for if an artery, for inſtance, is overcome by the action of the heart, and unnaturally dilated, its coats have commonly theſe concretions formed every where in their interſtices. The ſame thing happens alſo in the coats of incyſted tumors, which are conſtantly diſtended; in caſes of diſtentions of the Tunica Vaginalis Teſtis, &c. It is alſo apt to take place in parts which have loſt their natural functions; as in the coats of the eye in caſes of blindneſs, and in diſeaſed lymphatic glands, &c. and where the living power is diminiſhed in the ſyſtem, as in the arteries, membranes, &c. of old people; and in ſome particular habits, as in thoſe who are affected by the gout.

The ſame ſort of depoſition takes place likewiſe where there is any ſubſtance with ſuch properties as render it a fit *Baſis* for cryſtallization; as when extraneous bodies are lodged in the bladder: whence ſuch bodies are ſo often found to form the *Nucleus* of a ſtone. The ſame thing happens in the bowels of many animals; whence the *Nucleus* of inteſtinal concretions, or bezoars, is commonly a nail, or ſome indigeſtible ſubſtance which had been ſwallowed. The cruſt, which collects upon the Teeth, ſeems to be a cryſtallization of the ſame nature.

OF

TRANSPLANTING the TEETH.

FROM conſidering the almoſt conſtant variety of the ſize and ſhape of the ſame claſs of Teeth in different people, it would appear almoſt impoſſible to find the Tooth of one perſon that ſhould fit, with any degree of exactneſs, the ſocket of another; and this obſervation is ſupported, and indeed would ſeem to be proved by obſerving the Teeth in ſkeletons. Yet we can actually tranſplant a Tooth from one perſon to another, without great difficulty, nature aſſiſting the operation, if it is done in ſuch a way that ſhe can aſſiſt; and the only way in which nature can aſſiſt, with reſpect either to ſize or ſhape, is by having the fang of the tranſplanted Tooth rather ſmaller than the ſocket. The ſocket, in this caſe grows to the Tooth. If the fang is too large, it is impoſſible indeed to inſert it at all in that ſtate; however, if the fang ſhould be originally too large, it may be made leſs; and this ſeems to anſwer the purpoſe as well.

The ſucceſs of this operation is founded on a diſpoſition in all living ſubſtances, to unite when brought in-

contact with one another; although they are of a different ſtructure; and even although the circulation is only carried on in one of them.

This diſpoſition is not ſo conſiderable in the more perfect or complex animals, ſuch as quadrupeds, as it is in the more ſimple or imperfect; nor in old animals, as in young: for the living principle in young animals, and thoſe of ſimple conſtruction, is not ſo much confined to, or derived from one part of the body; ſo that it continues longer in a part ſeparated from their bodies, and even would appear to be generated in it for ſome time; while a part, ſeparated from an older, or more perfect animal, dies ſooner, and would appear to have its life entirely dependent on the body from which it was taken.

Taking off the young ſpur of a cock, and fixing it to his comb, is an old and well known experiment.

I have alſo frequently taken out the *Teſtis* of a cock and replaced it in his belly, where it has adhered, and has been nouriſhed; nay, I have put the *Teſtis* of a cock into the belly of a hen with the ſame effect.

In like manner a freſh Tooth, when tranſplanted from one ſocket to another, becomes to all appearance a part of that body to which it is now attached, as

much as it was of the one from which it was taken; while a Tooth which has been extracted for ſome time, ſo as to loſe the whole of its life, will never become firm or fixed; the ſockets will alſo in this caſe acquire the diſpoſition to fill up, which they do not in the caſe of the inſertion of a freſh Tooth.

Theſe appearances ſhew that the living principle exiſts in the ſeveral parts of the body, independent of the influence of the brain, or circulation, and that it ſubſiſts by theſe, or is indebted to them for its continuance; and in proportion as animals have leſs of brain and circulation, the living power has leſs dependence on them, and becomes a more active principle in itſelf; and in many animals there is no brain nor circulation, ſo that this power is capable of being continued equally by all the parts themſelves, ſuch animals being nearly ſimilar in this reſpect to vegetables.

A

PRACTICAL TREATISE

ON THE

DISEASES

OF THE

TEETH;

INTENDED AS A

SUPPLEMENT

TO THE

NATURAL HISTORY OF THOSE PARTS.

By JOHN HUNTER,

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INTRODUCTION.

THE importance of the Teeth is ſuch, that they deſerve our utmoſt attention, as well with reſpect to the preſervation of them, when in an healthy ſtate, as to the methods of curing them, when diſeaſed. They require this attention, not only for the preſervation of themſelves, as inſtruments uſeful to the body, but alſo on account of other parts with which they are connected; for diſeaſes in the Teeth are apt to produce diſeaſes in the neighbouring parts, frequently of very ſerious conſequences; as will evidently appear in the following Treatiſe.

One might at firſt imagine, that the diſeaſes of the Teeth muſt be very ſimple, and like thoſe which

take place every where elſe in the bony parts of our body; but experience ſhews the contrary. The Teeth being ſingular in their ſtructure, and ſome other circumſtances, have diſeaſes peculiar to themſelves. Theſe diſeaſes, conſidered abſtractedly, are indeed very ſimple; but by the relations which the Teeth bear to the body in general, and to the parts with which they are immediately connected, they become extremely complicated. The diſeaſes which may ariſe in conſequence of thoſe of the Teeth, are various; ſuch as Abceſſes, Carious Bones, &c.; many of which, although proceeding originally from the Teeth, are more the object of the Surgeon than of the Dentiſt, who will find himſelf as much at a loſs in ſuch caſes, as if the Abceſs or Carious Bone were in the leg, or any other diſtant part. All the diſeaſes of the Teeth, which are common to them with the other parts of the body, ſhould be put under the management of the Phyſician or Surgeon; but thoſe which are peculiar to the Teeth, and their connections, belong properly to the Dentiſt.

It is not my preſent purpoſe to enumerate every diſeaſe capable of producing ſuch ſymptoms as may lead

us

us to ſuſpect the Teeth; for the Jaws may be affected by almoſt every kind of diſorder. I ſhall therefore confine myſelf to the diſeaſes of the Teeth, Gums, and Alveolar Proceſſes; which parts having a peculiar connection, their diſeaſes fall properly within the province of the Dentiſt. I ſhall alſo purpoſely avoid entering into common Surgery; not to lead the Dentiſt beyond his depth, and to matters of which it is to be ſuppoſed he has not acquired a competent knowledge.

In order that the reader may perfectly underſtand what follows, it will be neceſſary for him previouſly to conſider and comprehend the anatomy and uſes of every part of a Tooth, as explained in my *Natural Hiſtory of the Human Teeth*, to which I ſhall be obliged frequently to refer. Without ſuch previous ſtudy, the Dentiſt will often be at a loſs to account for many of the diſeaſes and ſymptoms mentioned here, and will retain many vulgar errors imbibed by converſing with ignorant people, or by reading books in which the anatomy and phyſiology of the Teeth are treated without a ſufficient knowledge of the ſubject.

Whichever of the connected parts be originally diſeaſed, the Teeth are commonly the greateſt ſufferers. None of thoſe parts can be diſtempered, without communicating to the Teeth ſuch morbid effects, as tend to the deſtruction of them.

CHAP. I.

OF THE

DISEASES of the TEETH,

AND THE

CONSEQUENCES OF THEM.

SECT. I.

The Decay of the Teeth, ariſing from Rottenneſs.

THE moſt common diſeaſe to which the Teeth are expoſed, is ſuch a decay as would appear to deſerve the name of mortification. But there is ſomething more; for the ſimple death of the part would produce but little effect, as we find that Teeth are not ſubject to putrefaction after death; and therefore I am apt to ſuſpect, that, during life, there is ſome operation going on,

on, which produces a change in the diſeaſed part. It almoſt always begins externally in a ſmall part of the body of the Tooth, and commonly appears at firſt as an opaque white ſpot. This is owing to the enamel's loſing its regular and cryſtalized texture, and being reduced to a ſtate of powder, from the attraction of coheſion being deſtroyed; which produces ſimilar effects to thoſe of powdered cryſtal. When this has crumbled away, the bony part of the Tooth is expoſed; and when the diſeaſe has attacked this part, it generally appears like a dark brown ſpeck. Sometimes however, there is no change of colour, and therefore the diſeaſe is not obſervable, till it has made a conſiderable hole in the Tooth. The dead part is generally at firſt round, but not always; its particular figure depending more on the place where it begins, than on any other circumſtance. It is often obſerved on the hollow parts of the grinding ſurface of the *Molares*, and there looks like a crack filled with a very black ſubſtance. In the inciſors, the diſeaſe uſually begins pretty near the neck of the Tooth; and the ſcooping proceſs goes on enlarging the cavity, commonly acroſs the ſame part of the Tooth, which almoſt divides it into two. When ſuch a

diſeaſed

diſeaſed Tooth gives way, the miſchief is occaſioned by its body breaking off.

When it attacks the bony part, it appears firſt to deſtroy the earth, for the bone becomes ſofter and ſofter, and is at laſt ſo ſoft on the exterior expoſed ſurface, that it can be picked away with a pin, and when allowed to dry, it cracks like dried clay.

It begins ſometimes in the inſide of the Tooth, although but rarely. In this caſe the Tooth becomes of a ſhining black, from the dark colour being ſeen through the remaining ſhell of the Tooth, and no hole is found leading into the cavity.

This blackneſs is ſeldom more than a portion of the bony part decayed or mortified. However, it often happens, that the remaining part of the Tooth becomes ſimply dead; in which ſtate it is capable of taking on a dye. As it is generally on the external ſurface, one might expect no great miſchief would enſue; but the tendency to mortification goes deeper and deeper, till at laſt it arrives at the cavity of the Tooth, and the mortification follows. Mortification is

common

common to every part of the body: but in moſt other parts, this tendency is owing in a great meaſure to the conſtitution, which being corrected, that diſpoſition ceaſes; but here it is local, and as ſuch it would appear that we have no power of reſiſting it. When gone thus far, the decay makes a quicker progreſs, ſimilar to thoſe caſes where the decay begins in the cavity; for then this diſpoſition is given to the whole cavity of the Tooth, which being a much larger ſurface than what the diſeaſe had before to act upon, the increaſe of the decay ſeems to be in the ſame proportion: at laſt it ſcoops out its inner ſubſtance, till almoſt nothing is left but a thin ſhell, which, generally, being broken by maſtication, a ſmaller or larger opening is made, and the whole cavity becomes at length expoſed.

The canal in the Fang of the Tooth is more ſlowly affected: the ſcooping proceſs appears to ſtop there, for we ſeldom know a Fang become very hollow to its point, when in the form of a ſtump; and it ſometimes appears ſound, even when the body of the Tooth is almoſt deſtroyed: hence I conclude, that the Fang of the Tooth has greater living powers than the Body, by which the proceſs of the diſeaſe is retarded, and this

part

part appears at laſt only to loſe its living principle, and not to take on the mortifying proceſs above deſcribed; for which reaſon it remains ſimply a dead Fang; however it does not remain perfectly at reſt.

This is the ſtage in which it is called a Stump. It begins now to loſe its ſenſibility, and is ſeldom afterwards the cauſe of pain.

Thus in appearance, it will remain ſometimes for many years, but there will be more or leſs of a change going on; Nature will be attempting to make up the deficiency, by endeavouring to increaſe the Stump; for in many caſes we find the Stumps thickened and lengthened at their terminations, or ſmall ends; but it is a proceſs ſhe is not equal to, therefore no advantages accrue from it. When ſhe either fails in this proceſs, or is in ſuch a ſtate as not to attempt it, then by this condition of the Tooth a ſtimulus is given to the alveolar proceſſes, which produces a filling up of the ſocket from the bottom, whereby the Stumps are gradually protruded. But although they are puſhed out at the bottom, they ſeldom or never project farther beyond the gum than at firſt; and that part of the

Tooth which projects, ſeems to decay in proportion to its projection. Beſides this decay at the external end of the Stump, there is an abſorption of the Fang at the bottom, which is known by the following obſervation: the end of the Stump, which was in the gum or jaw, becomes irregularly blunted, and often rough, and has not the appearance of the end of the Fang of a ſound Tooth.

Such Stumps are in general eaſily extracted, being attached often to little more than the gum, and that ſometimes looſely.

Although the diſeaſe appears to be chiefly in the Tooth itſelf, and but little to depend on external cauſes, yet in many caſes the part which is already rotten, ſeems to have ſome influence upon that which remains; for if the rotten part be perfectly removed before it has arrived at the canal of the Tooth, a ſtop is ſometimes put to the farther progreſs of the decay, at leaſt for a time.

However this is not conſtantly ſo; it is oftener the contrary; but it is expedient in moſt caſes to make this trial, as it is always right to keep a Tooth clean, and free from ſpecks.

This

This decay of the Teeth does not ſeem to be ſo entirely the effect of accident as might be imagined; for it ſometimes takes place in them by pairs, in which caſe we may ſuppoſe it owing to an original cauſe coming into action at its ſtated time; the correſponding Teeth being in pairs, with reſpect to the diſeaſe, as well as to ſituation, ſhape, &c.

This opinion is ſomewhat ſtrengthened by the fore Teeth in the lower Jaw not being ſo ſubject to decay as thoſe in the upper, although equally liable to all accidents ariſing from external influence, which could produce the diſeaſe in general.

The fore Teeth in the lower Jaw appear to be leſs ſubject to this diſeaſe than any of the others; the fore Teeth in the upper Jaw, and the grinders in both, are of courſe more frequently affected.

This diſeaſe and its conſequences ſeem to be peculiar to youth and middle age; the ſhedding Teeth are as ſubject to it, if not more ſo, than thoſe intended to laſt through life; and we ſeldom or ever ſee any per-

ſon, whoſe Teeth begin to rot after the age of fifty years,

This might be ſuppoſed to ariſe from the diſproportion that the number of Teeth after fifty bear to them before it; but the number of diſeaſed Teeth after fifty do not bear the ſame proportion.

This diſeaſe has not hitherto been accounted for; if it had been always on the inſide of the cavity, it might have been ſuppoſed to be owing to a deficiency of nouriſhment from ſome fault in the vaſcular ſyſtem; but as it begins moſt commonly externally, in a part where the Teeth in their moſt ſound ſtate receive little or no nouriſhment, we cannot refer it to that cauſe.

It does not ariſe from any external injury, or from menſtrua, which have a power of diſſolving part of a tooth; for any thing of that kind could not act ſo partially: and we can obſerve in thoſe Teeth where the diſeaſe has not gone deep, that from the black ſpeck externally there is a gradual decay or alteration leading to the cavity, and becoming fainter and fainter. We may therefore

therefore reaſonably ſuppoſe, that it is a diſeaſe ariſing originally in the Tooth itſelf; becauſe when once the ſhell of the Tooth has given way to the cavity, the cavity itſelf ſoon becomes diſeaſed in the ſame way. That the diſeaſe ſpreads thus rapidly over the cavity, as ſoon as the Tooth has given way, does not depend ſimply on the expoſure; for if a ſound Tooth be broken by accident, ſo as to expoſe the cavity, no ſuch quick decay enſues: however, ſometimes we find in thoſe caſes, that expoſure of the cavity will produce a decay, and even pain, ſimilar to an original diſeaſe; and in the diſeaſed Tooth we find that the expoſure has a conſiderable effect in haſtening the progreſs of the diſeaſe; for if the Tooth be ſtopped ſo as to prevent its expoſure to external injury, its cavity will not nearly ſo ſoon become diſeaſed. Expoſure therefore ſeems at leaſt to aſſiſt the decay.

How far a rotten Tooth has the power of contaminating thoſe next to it, I believe, is not yet completely aſcertained; ſome caſes ſeem to favour this idea, and many to contradict it. We frequently ſee two Teeth rotten in places exactly oppoſite to each other, and as one of them began firſt to decay, it gives a ſuſpicion

that

that the laſt diſeaſed was infected by that which received the firſt morbid impreſſion.

On the contrary, we often ſee one diſeaſed, whilſt another Tooth, in contact with the decayed part, remains perfectly ſound.

SYMPTOMS of INFLAMMATION.

FEW or no ſymptoms are produced by this diſeaſe, beſides the above appearances, till the cavity of the Tooth is expoſed; however, it often happens, that a tenderneſs, or a ſoreneſs upon touch, or other external influences, takes place long before; but when the cavity is expoſed, then pain and other ſymptoms often begin, which are generally very conſiderable: however, the expoſure of the cavity of a Tooth, does not in all caſes give pain. Some Teeth ſhall moulder wholly away, without ever having any ſenſation.

In many caſes, there will be very acute pain upon the cavity being expoſed, which will ſubſide, and recur again,

again, without producing any other effect; but it more frequently happens, that this pain is the firſt ſymptom of inflammation, and is in moſt caſes very conſiderable; more ſo than that ariſing from ſuch an inflammation in other places. The ſurrounding parts ſympathize commonly to a conſiderable extent, viz. the Gums, Jaw-bones, and integuments covering them; they inflame and ſwell ſo much as to affect the whole of that ſide of the face, where the affected Tooth is ſituated. The mouth can hardly be opened; the glands of that ſide of the neck often ſwell; there is an increaſe of the ſaliva, and the eye is almoſt cloſed; the Tooth not giving way to the ſwelling of the ſoft parts within it: and for this reaſon the local effects of the Inflammation cannot be ſo viſible as in the ſoft parts.

This inflammation of the Tooth often laſts a conſiderable time, and then gradually ſubſides. We may ſuppoſe, according to the general law of inflammation, that it is at firſt of the adheſive kind, and accordingly we ſometimes find the Teeth ſwelled at their ends, which is a character of the adheſive ſtage of inflammation; and ſometimes two fangs are grown together. That we ſeldom find adheſions between the Teeth and

ſur-

ſurrounding parts may be reaſonably imputed to their leſs aptitude for ſuch connections. The ſuppurative inflammation ſucceeds; but as a Tooth has not that power of ſuppuration which leads to granulations, ſo as to be buried, covered up, and made part of ourſelves, as happens to other bones, (which would deſtroy any uſe of a Tooth) the inflammation wears out, or rather the parts not being ſuſceptible of this irritation, beyond a certain time, the inflammation gradually goes off, and leaves the Tooth in its original diſeaſed ſtate. No permanent cure therefore can poſſibly be effected by ſuch inflammations, but the parts being left in the ſame ſtate as before, they are ſtill ſubject to repetitions of inflammation, till ſome change takes place, preventing future attacks, which I believe is generally, if not always, effected by the deſtruction of thoſe parts which are the ſeat of it, *viz.* the ſoft parts within the Tooth.

Nature ſeems, in ſome meaſure, to have conſidered the Teeth as aliens, only giving them nouriſhment while ſound and fit for ſervice, but not allowing them when diſeaſed the common benefits of that ſociety in which they are placed. They cannot exfoliate, as no operations go on in them except growth; therefore, if any

part

part is dead, the living has not the power of throwing it off, and forming an external ſurface capable of ſupporting itſelf, like the other parts of the body: indeed, if they had ſuch a power, no good purpoſe could be anſwered by it; for a piece of Tooth, ſimply dead, is almoſt as uſeful as if the whole was living: which may be obſerved every day.

The pain, however, appears to take its riſe from the Tooth as a centre. That it ſhould be more ſevere than what is generally produced by ſimilar inflammations in other parts of the body, may, perhaps, be accounted for, when we conſider, that theſe parts do not readily yield; as is likewiſe the caſe in whitloes.

It ſometimes happens, that the mind is not directed to the real ſeat of the diſeaſe, the ſenſation of pain not ſeeming to be in the diſeaſed Tooth, but in ſome neighbouring Tooth which is perfectly ſound. This has often miſled operators, and the ſympathiſing Tooth has fallen a ſacrifice to their ignorance.

In all caſes of diſeaſed Teeth, the pain is brought on by circumſtances unconnected with the diſeaſe; as

for inſtance Cold, wherefore they are more troubleſome commonly in winter than in ſummer. Extraneous matter entering the cavity, and touching the nerve and veſſels, will alſo bring on the pain.

This pain is frequently obſerved to be periodical; ſometimes there being a perfect intermiſſion, ſometimes only an abatement of it. The paroxyſm comes on once in twenty four hours; and, for the moſt part, towards the evening. The bark has therefore been tried; but that failing, the diſorder has been ſuſpected to be of the rheumatic kind, and treated accordingly with no better ſucceſs. At length, after a more particular examination of the Teeth, one of them has been ſuſpected to be unſound; and, being extracted, has put an end to the diſorder. This ſhews how injudicious it is to give medicines in ſuch caſes, while the true ſtate of the Tooth is unknown.

This diſeaſe is often the cauſe of bad breath, more ſo than any other diſeaſe of thoſe parts; eſpecially when it has expoſed the cavity of the Tooth. This moſt probably ariſes from the rotten part of the Tooth,

and

and the juices of the mouth, and food, all ſtagnating in this hollow part, which is warm, and haſtens putrefaction in them.

I come now to the prevention and cure of this diſeaſe.

The firſt thing to be conſidered, is, the cure of the decaying ſtate of the Tooth, or rather the means of preventing the farther progreſs of the decay; and more eſpecially before it hath reached the cavity, whereby the Tooth may be in ſome degree preſerved; the conſequent pain and inflammations, commonly called Tooth-ach, avoided, and often the conſequent abſceſſes called Gum Boils. I believe, however, that no ſuch means of abſolute prevention are as yet known. The progreſs of the diſeaſe, in ſome caſes, appears to have been retarded, by removing that part which is already decayed; but experience ſhews, that there is but little dependence upon this practice. I have known caſes, where the black ſpot having been filed off, and ſcooped entirely out, the decay has ſtopped for

many years. This practice is ſuppoſed to prevent at leaſt any effect, that the part already rotten may have upon the ſounder parts; however, if this is all the good that ariſes from this practice, I believe, in moſt caſes, it might be as well omitted. Even if it were an effectual practice, it could not be an univerſal one; for it is not always in the power of the operator to remove this decayed part, either on account of its ſituation, or on account of its having made too great a progreſs, before it is diſcovered. When it is on the baſis of a grinder, or on the poſterior ſide of its neck, it can ſcarcely be reached. It becomes alſo impracticable, when the diſeaſe is ſtill allowed to go on, and the cavity becomes expoſed, ſo that the patient is now liable to all the conſequences already deſcribed, and the Tooth is making haſte towards a total decay; in ſuch a caſe, if the decay be not too far advanced; that is, if it be not rendered uſeleſs ſimply as a Tooth, I would adviſe that it be extracted; then immediately boiled, with a view to make it perfectly clean, and alſo deſtroy any life there may be in the Tooth; and then that it be reſtored to the ſocket: this will prevent any farther decay of the Tooth, as it is now dead, and not to be acted

acted upon by any diſeaſe, but can only ſuffer chymically or mechanically.

This practice, however, I would only recommend in grinders, where we have no other reſource on account of the number of fangs, as will be more fully explained hereafter. This practice has ſometimes been followed with ſucceſs; and when it does ſucceed, it anſwers the ſame end as the burning the nerve, but with much greater certainty.

If the patient will not ſubmit to have the Tooth drawn, the nerve may be burned: that this may have the deſired effect, it muſt be done to the very point of the fang, which is not always poſſible. Either of the concentrated acids, ſuch as thoſe of vitriol, nitre, or ſea ſalt, introduced as far into the fang of the Tooth as poſſible, is capable of deſtroying its ſoft parts, which moſt probably are the ſeat of pain: a little cauſtic alkali will produce the ſame effect. But it is a difficult operation to introduce any of theſe ſubſtances into the root of the fang, till the decay has gone a conſiderable length, eſpecially, if it be a Tooth of the upper jaw; for it is hardly poſſible to make fluids paſs againſt their own gravity;

gravity; in theſe caſes, the common cauſtic is the beſt application, as it is a ſolid. The cauſtic ſhould be introduced with a ſmall doſſil of lint, but even this will ſcarcely convey it far enough. If it be the lower jaw, the cauſtic need only be introduced into the hollow of the Tooth, for by its becoming fluid, by the moiſture of the part, it will then deſcend down the cavity of the fang, as will alſo any of the acids; but patients will often not ſuffer this to be done, till they have endured much pain, and ſeveral inflammations.

When there is no other ſymptom except pain in the Tooth, we have many modes of treatment recommended, which can only be temporary in their effects. Theſe act by derivation, or ſtimulus applied to ſome other part of the body. Thus to burn the ear by hot irons, has ſometimes been a ſucceſsful practice, and has relieved the Tooth-ach.

Some ſtimulating medicine, as ſpirit of lavender, ſnuffed up into the noſe, will often carry off the pain.

When an inflammation takes place in the ſurrounding parts, it often is aſſiſted by an additional cauſe, as cold,

cold, or fever: when the inflammation hath taken place in a great degree, then it becomes more the object of another conſideration; for it may be leſſened like any other inflammation ariſing from ſimilar cauſes, the preſſure of an extraneous body, or expoſure of an internal cavity.

If the inflammation be very great, it will be proper to take away ſome blood. The patient may likewiſe properly be adviſed to hold ſome ſtrong vinous ſpirit for a conſiderable time, in his mouth. Diluted acids, as vinegar, &c. may likewiſe be of uſe, applied in the ſame manner. Likewiſe, preparations of lead would be adviſeable; but theſe might prove dangerous, if they ſhould be accidentally ſwallowed.

If the ſkin is affected, poultices, containing ſome of the above-mentioned ſubſtances, produce relief. The pain, in many caſes, being often more than the patient can well bear, warm applications to the part have been recommended, ſuch as hot brandy, to divert the mind; alſo ſpices, eſſential oils, &c. which laſt are, perhaps, the beſt. A little lint or cotton ſoaked in laudanum, is often applied with ſucceſs; and laudanum ought

ought likewiſe to be taken internally, to procure an interval of ſome eaſe. Bliſters are of ſervice in moſt inflammations of theſe parts, whether they ariſe from a diſeaſed Tooth, or not. They cannot be applied to the part, but they divert the pain, and draw this ſtimulus to another part: they may be conveniently placed either behind the ear, or in the nape of the neck. Theſe laſt-mentioned methods can only be conſidered as temporary means of relief, and ſuch as only affect the inflammation. Therefore the Tooth is ſtill expoſed to future attacks of the ſame diſeaſe.

STOPPING of the TEETH.

IF the deſtruction of the life of the Tooth, either by drawing and reſtoring it again, or by the actual or potential cauteries, has not been effected, and only the cure of the inflammation has been attempted, another method of preventing inflammation is to be followed, which is to allow as little ſtimulus to take place as poſſible. The cavity of the Tooth not being capable of taking the alarm like moſt other cavities in the

the body, and of courſe not ſuppurating, as has been already obſerved, often no more is neceſſary, either to prevent the inflammation from taking place altogether, or extending farther, than to exclude all extraneous irritating matter; therefore, the ſtopping up the cavity becomes, in many caſes, the means of preventing future attacks of the inflammation, and often retards even the progreſs of the diſeaſe, that is, the farther decay of the Tooth, ſo that many people go on for years thus aſſiſted: but it is a method which muſt be put in practice early, otherwiſe it cannot be continued long; for, if the diſeaſe has done conſiderable damage to the inſide of the Tooth, ſo as to have weakened it much, the whole body of the Tooth, moſt probably, will ſoon give way in maſtication: therefore, under ſuch circumſtances, the patient muſt be cautioned, not to make too free with the Tooth in eating.

Gold and lead are the metals generally made uſe of for ſtopping Teeth. Gold being leſs pliable, muſt be uſed in the leaf; lead is ſo ſoft in any form, as to take on any ſhape by a very ſmall force.

Stuffing the hollow Tooth with wax, galbanum, &c. can be but of very little ſervice, as it is in moſt caſes impoſſible to confine theſe ſubſtances, or preſerve them from being ſoon worn away; however, they have their uſes, as it is a practice which the patients themſelves can eaſily put in execution.

It often happens from neglect, and much oftener in ſpite of all the means that can be uſed, that the Tooth becomes ſo hollow, as to give way, whereby the paſſage becomes too large to keep in any of the above-mentioned ſubſtances; however, in this caſe, it ſometimes happens, that a conſiderable part of the body of the Tooth will ſtill ſtand, and then a ſmall hole may be drilled through this part, and after the cavity hath been well ſtopped, a ſmall peg may be put into the hole, ſo as to keep in the lead, gold, &c. But when this cannot be done, we may conſider the broken Tooth as entirely uſeleſs, or at leaſt it will ſoon be ſo; and it is now open to attacks of inflammation, which the patient muſt either bear, or ſubmit to have the Tooth pulled out. If the firſt be choſen, and the repeated inflammations ſubmitted to, a cure will be performed in time, by the

ſtump

ſtump becoming totally dead ; but it is better to have it pulled out, and ſuffer once for all.

Upon pulling out theſe Teeth, we may in general obſerve a pulpy ſubſtance at the root of the fang, ſo firmly adhering to the fang, as to be pulled out with it. This is in ſome pretty large, ſo as to have made a conſiderable cavity at the bottom of the ſocket. This ſubſtance is the firſt beginning of the formation of a Gum Boil, as it at times inflames and ſuppurates.

SECT. II.

The Decay of the Teeth, by Denudation.

THERE is another decay of the Teeth much leſs common than that already deſcribed, which has a very ſingular appearance. It is a waſting of the ſubſtance of the Tooth very different from the former. In all the inſtances I have ſeen, it has begun on the exterior ſurface of the Tooth, pretty cloſe to the arch of the gum. The firſt appearance is a want of enamel, whereby the bony part is left expoſed, but neither the enamel, nor the bony part alter in conſiſtence as in the above deſcribed decay. As this decay ſpreads, more and more of the bone becomes expoſed, in which reſpect alſo it differs from the former decay; and hence it may be called a denuding proceſs. The bony ſubſtance of the Teeth alſo gives way, and the whole waſted ſurface has exactly the appearance, as if the Tooth had been filed with a rounded file, and afterwards

wards had been finely poliſhed. At theſe places the bony parts, being expoſed, become brown.

I have ſeen inſtances, where it appeared as if the outer ſurface of the bony part, which is in contact with the inner ſurface of the enamel, had firſt been loſt, ſo that the attraction of coheſion between the two had been deſtroyed; and as if the enamel had been ſeparated for want of ſupport, for it terminated all at once.

In one caſe, the two firſt inciſors had loſt the whole of the enamel; on their anterior ſurfaces, they were hollowed from ſide to ſide, as if a round file had been applied to them longitudinally, and had the fineſt poliſh imaginable. The three grinders on each ſide appeared as if a round file had been uſed on them, in a contrary direction to that on the inciſors, *viz.* acroſs their bodies cloſe to the gum, ſo that there was a groove running acroſs their bodies, which was ſmooth in the higheſt degree. Some of the other Teeth in the ſame jaw had begun to decay in a ſimilar manner; alſo the Teeth in the lower jaw were become diſeaſed.

I ſaw

I ſaw a caſe very lately, where the four inciſors of the upper jaw had loſt their enamel entirely on their anterior ſurfaces, and there was ſcarcely a Tooth in the mouth, which had not the appearance of having had a file applied acroſs it cloſe to the gum.

Thoſe whom I have known, have not been able to attribute this diſeaſe to any cauſe; none of them had ever done any thing particular to the Teeth, nor was there in appearance any thing particular in the conſtitution, which could give riſe to ſuch a diſeaſe. In the firſt of theſe caſes, the perſon was about forty; in the laſt, about twenty years of age.

From its attacking certain Teeth rather than others, in the ſame head, and a particular part of the Tooth, I ſuſpect it to be an original diſeaſe of the Tooth itſelf; and not to depend on accident, way of life, conſtitution, or any particular management of the Teeth.

SECT. III.

Swelling of the Fang.

ANOTHER diſeaſe of the Teeth is a ſwelling of the Fang, which moſt probably ariſes from inflammation, while the body continues ſound, and is of that kind which in any other bone would be called a Spina Ventoſa*. It gives conſiderable pain, and nothing can be ſeen externally.

The pain may either be in the Tooth itſelf, or the alveolar proceſs, as it is obliged to give way to the increaſe of the Fang.

As a ſwelling of this kind does not tend to the ſuppurative inflammation, and as I have not been able to diſtinguiſh its ſymptoms from thoſe of the nervous Tooth-ach, it becomes a matter of ſome difficulty to the operator; for the only cure yet known is the ex-

* Vide Natural Hiſtory of the Teeth, page 37.

traction

traction of the Tooth; which has been often neglected on a ſuppoſition that the pain has been nervous.

Theſe diſeaſes of the Teeth, ariſing from inflammation, become often the cauſe of diſeaſes in the alveolar proceſſes, and gums; which I ſhall proceed to deſcribe.

SECT.

SECT. IV.

Gum Boils.

ALTHOUGH ſuppuration cannot eaſily take place within the cavity of a Tooth, yet it often happens, that the inflammation, which is extended beyond it, is ſo great, as to produce ſuppuration in the jaw at the bottom of the ſocket, where the diſeaſed Tooth is, forming there a ſmall abceſs, commonly called a Gum Boil.

This inflammation is often very conſiderable, eſpecially when the firſt ſuppuration takes place. It is often more diffuſed than inflammations in other parts, and affects the whole face, &c.

The matter, as in all other abceſſes, makes its own way outwards, and as it cannot be evacuated through the Tooth, it deſtroys the alveolar proceſſes, and tumifies the gum, generally on the fore part, either pointing

directly at the root of the Tooth, or ſeparating the gum from it; and is evacuated in one or other of theſe two ways, ſeldom on the inſide of the gum: however, this ſometimes happens.

Gum boils ſeldom ariſe from other cauſes; however, it ſometimes happens that they originate from a diſeaſe in the ſocket or jaw, having no connection with the Tooth, and only affecting it ſecondarily. Upon drawing ſuch Teeth, they are generally found diſeaſed at or near the point, being there very rough and irregular, ſimilar to ulcerating bones. There is no diſeaſe to appearance in the body of the Tooth. Theſe laſt deſcribed Gum Boils may ariſe wholly from ſuch a cauſe, the appearance on the fang of the Tooth being only an effect.

Theſe abceſſes, whether ariſing from the Teeth or the ſockets, always deſtroy the alveolar proceſſes on that ſide where they open; as is very evident in the jaw-bones of many ſculls; on which account the Tooth becomes more or leſs looſe. It may be perceived in the living body; for when the alveolar proceſs is intirely deſtroyed on the outſide of the Tooth, if

that

that Tooth be moved, the motion will be obſerved under the gum, along the whole length of the fang.

So far the Teeth, alveolar proceſſes, and gums, become diſeaſed by conſent.

It is common for theſe abceſſes to ſkin over, and, in all appearance, heal. This is peculiar to thoſe which open through the Gums, but thoſe which diſcharge themſelves between the Gums and Teeth, can never heal up, becauſe the Gum cannot unite with the Tooth; however, the diſcharge in them becomes leſs at times, from a ſubſiding of the ſuppuration; which indeed is what allows the other to ſkin over. But either expoſure to cold, or ſome other accidental cauſe, occaſioning a freſh inflammation, produces an increaſed ſuppuration, which either opens the old orifice in the Gum, or augments the diſcharge by the ſide of the Tooth; however, I believe, the inflammation in this laſt caſe is not ſo violent as in the other, where a freſh ulceration is neceſſary for the paſſage of the matter.

Thus a Gum Boil goes on for years, healing and opening alternately; the effect of which is, that the alveolar proceſſes are at length abſorbed, and the Tooth gets looſer and looſer, till it either drops out, or is extracted.

Moſt probably in all ſuch caſes, the communication between the cavity of the Tooth, and the Jaw, is cut off; yet it keeps in part its lateral attachments, eſpecially when the gum graſps the Tooth; but in thoſe caſes, where the matter paſſes between the Gum and the Tooth, theſe attachments are leſs; but ſome of them are ſtill retained, particularly on the ſide oppoſite to the paſſage for the matter.

Gum Boils are eaſily known. Thoſe which open through the Gum may be diſtinguiſhed by a ſmall riſing between the arch of the Gum, and the attachment of the lip; upon preſſing the Gum at the ſide of this point, ſome matter will commonly be obſerved, oozing out at the eminence. This eminence ſeldom ſubſides entirely; for even when there is no diſcharge, and the opening is healed over, a ſmall riſing may ſtill

ſtill be perceived, which ſhews that the Gum Boil has been there.

Thoſe Gum Boils which diſcharge themſelves between the Gum and the Tooth, are always diſcovered by preſſing the Gum, whereby the matter is preſſed out, and is ſeen lying in the angle between the Gum and Tooth.

Theſe abceſſes happen much more frequently in the upper jaw, than in the lower, and alſo more frequently to the *cuſpidati*, *inciſores*, and *bicuſpides* in that jaw, than to the *molares*; ſeldom to the fore Teeth in the lower jaw.

As Gum Boils are in general the conſequence of rotten Teeth, we find them in young and middle aged people more frequently than in old; but they appear to be moſt common to the ſhedding Teeth. This will ariſe from thoſe Teeth being more liable to become rotten; and perhaps there may be another reaſon, *viz.* the proceſs of ulceration which goes on in theſe Teeth *, in ſome caſes falling into ſuppuration.

* Vide Natural Hiſtory of the Teeth, for an Explanation of this Proceſs in thoſe Teeth, p. 98, 99.

It ſometimes happens in theſe Gum Boils, that a fungus will puſh out at the orifice, from a luxuriant diſpoſition to form granulations, in the inſide of the abceſs, and the want of power to heal or ſkin; the ſame thing frequently happens in iſſues, where the parts have a diſpoſition to granulate, but have not the power of healing, on account of an extraneous body being kept there. The Tooth in the preſent caſe acts as an extraneous body, and by the ſecretion of matter the abceſs is prevented from healing.

In the treatment of Gum Boils, the practice will be the ſame, whether the abceſs has ariſen from a diſeaſed Tooth, or a diſeaſe in the ſocket.

The Teeth being under ſuch circumſtances in the animal machine, that they cannot partake of all the benefits of a cure in the ſame manner as other parts do; on that account, when an abceſs forms itſelf about the root of a Tooth, the Tooth by loſing its connection with the other parts, loſes every power of union, as it is not endowed with the power of granulating, and thereby it becomes an extraneous body, or at leaſt acts here as an extraneous body, and one of the

the worſt kind, ſuch as it is not in the power of any operation of the machine to get rid of. This is not the caſe with any other part of the body, for when any other part becomes dead, the machine has the power of ſeparating it from the living, called ſloughing or exfoliation, and expelling it, whence a cure is effected; but in the caſe of Gum Boils, the only cure of them is the extraction of the Tooth. As this is the laſt reſource, every thing is to be done to make the parts as eaſy under the diſeaſe as poſſible, ſo that this operation may be poſtponed.

When the abceſs has opened through the Gum, I believe the beſt method that can be tried with a view to prevent future gatherings, is to prevent the cloſing up of the abceſs; and this may be done, by enlarging the opening, and keeping it enlarged, till the whole internal ſurface of the cavity of the abceſs is ſkinned over, or till the opening in the Gum loſes the diſpoſition to cloſe up, which will in a great meaſure prevent any future formation of matter; or at leaſt whatever is formed will find an eaſy outlet, which will prevent theſe accumulations from taking place ever after. The end of the fang will indeed be hereby expoſed; but, under

under ſuch circumſtances it will not be in a worſe ſituation than when ſoaked in matter.

One method of doing this is to open the Gum Boils by a crucial inciſion, the full width of the abceſs, and fill it well with lint, which ſhould be dipped in lime water, or a diluted ſolution of lunar cauſtic; made by diſſolving one drachm of the cauſtic in two ounces of diſtilled water; and the wound ſhould be dreſſed very frequently, as it is with difficulty that the dreſſing can be kept in. If this is not ſufficient to keep the wound open, it may be touched with the lunar cauſtic, ſo as to produce a ſlough; and this may be repeated, if it ſhould be found neceſſary.

One conſiderable diſadvantage occurs in this practice, which is the difficulty of keeping on the dreſſings; but conſtant attention will make up for the inconvenience of ſituation.

If the ſurface of the abceſs be touched with the lapis ſepticus, and the lip kept from coming in contact with the part for one minute, it anſwers better than

than any other method; for this, within that ſpace of time, will penetrate to the bottom.

The ſurface of the boil ſhould be firſt wiped dry, as much as the nature of the part will allow, to prevent as much as poſſible the ſpreading of the cauſtic; which by care can be prevented, as the operator will watch it the whole time.

To extract the Tooth, then to file off any diſeaſed part of it, and immediately to replace it, has been practiſed, but often without the deſired ſucceſs; for it has often happened, that a Tooth has been introduced into a diſeaſed jaw. This practice, however, now and then, has ſucceeded.

When a Gum Boil is formed on a back Tooth, or *Molares*, ſuch very nice treatment is not neceſſary, as when it happens to the fore Teeth; becauſe, appearances are there of leſs conſequence; therefore, the gum may be ſlit down upon the fang through its whole length, from the opening of the Gum Boil to its edge, which will prevent any future union; and the whole cavity of the abceſs, ſkinning over, will prevent any future collec-

tion of matter. The wound appears afterwards like the hare lip, and therefore this practice is not adviſeable where it would be much in view; as when the diſeaſe is in the fore Teeth. In theſe caſes, where the granulations puſh out through the ſmall opening, they may be cured by the method above mentioned; but, if it is not complied with, they may be very ſafely cut off with a knife or launcet. However, this does not effect a cure; for they commonly riſe again. To ſlit the gum, in this caſe, has been common, but it is a bad method, whenever the defect is in ſight.

SECT.

SECT. V.

Excreſcences from the Gum.

FROM bad Teeth there are alſo ſometimes excreſcences, ariſing at once out of the Gum; near, or in contact with, the diſeaſed Tooth.

In general they are eaſily extracted with a knife, or whatever cutting inſtrument can be beſt applied; but this will vary according to their ſituations, and the extent of their baſe.

They will often riſe in a day or two after the operation as high as ever; but this newly-generated matter generally dies ſoon, and the diſeaſe terminates well. They have often ſo much of a cancerous appearance, as to deter ſurgeons from meddling with them; but where they ariſe at once from the Gum, and appear

to be the only diſeaſed part, I believe they have no malignant diſpoſition.

However, I have ſeen them with very broad baſes, and where the whole could not be removed, and yet no bad conſequences have attended their removal. Theſe often riſe again in a few years, by which means they become very troubleſome.

After the extirpation of them, it is often neceſſary to apply the actual cautery to ſtop the bleeding; for arteries going to increaſed parts are themſelves increaſed, and alſo become diſeaſed; and have not the contractile power of a ſound artery.

SECT. VI.

Deeply-ſeated Abceſſes in the Jaws.

SOMETIMES deeper Abceſſes occur than thoſe commonly called Gum Boils. They are often of very ſerious conſequences, producing carious bones, &c. Theſe commonly ariſe from a diſeaſe in the Tooth, and more eſpecially in the *cuſpidati*; thoſe Teeth paſſing farther into the jaw than the others. Their depth in the jaw being beyond the attachment of the lip to the gum, if an abceſs forms at their points, it more readily makes its way through the common integuments of the face, than between the gum and lip, which diſfigures the face; and when in the lower jaw, looks like the evil.

In the upper jaw it makes a diſagreeable ſcar on the face, about half an inch from the noſe.

Theſe,

Theſe, although they may ſometimes ariſe from diſeaſes of the Teeth and Gums, yet are properly the object of common ſurgery; and the Surgeon muſt apply to the Dentiſt, if his aſſiſtance is neceſſary, to pull out the Tooth, or to perform any other operation which comes under his province.

It ſometimes happens that the abceſs is ſituated ſome way from the root of the diſeaſed Tooth, both in the upper jaw and the lower; but, I think, more frequently in the lower. When it threatens to open externally on the ſkin of the face, great care ſhould be taken to prevent it, and an opening very early made into the ſwelling on the inſide of the lip; for it is generally very readily felt there. This practice of early opening theſe abceſſes upon the inſide of the mouth is more neceſſary, when the abceſs is in the lower jaw, than when in the upper; becauſe matter by its weight always produces ulceration more readily at the lower part. I have ſeen this practice anſwer, even when the matter had come ſo near the ſkin, as to have inflamed it. If it is in the upper, the opening need not be ſo very large; as the matter will have a depending outlet.

To prevent a relapſe of the diſeaſe, it will in moſt caſes be neceſſary to pull out the Tooth; which has either been the firſt cauſe, or has become diſeaſed, in conſequence of the formation of the abſceſs; and in either caſe is capable of reproducing the diſeaſe.

The mouth ſhould be often waſhed; and while the water is within the mouth, the ſkin ſhould be preſſed oppoſite to the abceſs.

If the life of the bone be deſtroyed, it will exfoliate; and very probably two or three of the Teeth may come away with the exfoliation. Little ſhould be done in ſuch caſes, except that the patient ſhould keep the mouth as clean as poſſible by frequently waſhing it, and when the bones exfoliate, they ſhould be removed as ſoon as poſſible. In theſe caſes it is but too common for the Dentiſt to be very buſy, and perhaps do miſchief through ignorance.

SECT. VII.

Abceſs of the Antrum Maxillare.

THE *Antrum Maxillare* is very ſubject to inflammation and ſuppuration, by means of diſeaſes of the neighbouring parts, and particularly of the duct leading to the noſe being obliterated. Whether this is the cauſe, or only an effect, is not eaſily determined, but there is great reaſon to ſuppoſe it an attendant, from ſome of the ſymptoms. If it be a cauſe, we may ſuppoſe, that the natural mucus of theſe cavities accumulating, irritates and produces inflammation for its own exit; in the ſame manner as an obſtruction to the paſſage of the Tears through the *ductus ad Naſum*, produces an abceſs of the *lachrymal ſac*.

This inflammation of the *Antrum* gives a pain which will be at the firſt taken for the Tooth-ach, eſpecially if there be a bad Tooth in that ſide; however,

in

in theſe caſes, the noſe is more affected than commonly in a Tooth-ach.

The eye is alſo affected; and it is very common for people with ſuch a diſeaſe to have a ſevere pain in the forehead, where the frontal ſinus's are placed; but ſtill the ſymptoms are not ſufficient to diſtinguiſh the diſeaſe. Time muſt diſcloſe the true cauſe of the pain; for it will commonly continue longer than that which ariſes from a diſeaſed Tooth, and will become more and more ſevere; after which a redneſs will be obſerved on the fore part of the cheek, ſomewhat higher than the roots of the Teeth, and a hardneſs in the ſame place, which will be conſiderably circumſcribed. This hardneſs may be felt rather highly ſituated on the inſide of the lip.

As this diſeaſe has been often treated of by ſurgeons, I ſhall only make the following remarks concerning it.

The firſt part of the cure, as well as of that of all other abceſſes, is to make an opening, but not in the part where it threatens to point; for that would generally be through the ſkin of the cheek.

If the diſeaſe is known early, before it has cauſed the deſtruction of the fore part of the bone, there are two ways of opening the abceſs: one by perforating the partition between the antrum and the noſe, which may be done; and the other by drawing the firſt or ſecond grinder of that ſide, and perforating the partition between the root of the alveolar proceſs and the antrum, ſo that the matter may be diſcharged for the future that way.

But if the fore part of the bone has been deſtroyed, an opening may be made on the inſide of the lip, where the abceſs moſt probably will be felt; but this will be more apt than the other perforation to heal, and thereby may occaſion a new accumulation; which is to be avoided, if poſſible, by putting in practice all the common methods of preventing openings from healing or cloſing up; but this practice will rather prove troubleſome; therefore the drawing the Tooth is to be preferred, becauſe it is not ſo liable to this objection.

CHAP. II.

OF THE

DISEASES of the ALVEOLAR PROCESSES,

AND THE

CONSEQUENCES OF THEM.

HAVING thus far treated of the diſeaſes of the Teeth themſelves, and thoſe of the Sockets and Gums, which either ariſe from them, or are ſimilar to ſuch as ariſe from them, I come now to conſider the diſeaſes which take place primarily in the Sockets, when the Teeth are perfectly ſound: theſe appear to be two; and yet I am not ſure but that they are both fundamentally the ſame, proceeding together from the ſame cauſe, or one depending on the other.

The firſt effect, which takes place, is a waſting of the Alveolar Proceſſes, which are in many people gradually abſorbed, and taken into the ſyſtem. This waſting begins firſt at the edge of the ſocket, and gradually goes on to the root or bottom.

The Gum, which is ſupported by the Alveolar Proceſs, loſes its connection, and recedes from the body of the Tooth, in proportion as the ſocket is loſt; in conſequence of which, firſt the neck, and then more or leſs of the fang itſelf, becomes expoſed. The Tooth of courſe becomes extremely looſe, and at laſt drops out.

The other effect is a filling up of the ſocket at the bottom, whereby the Tooth is gradually puſhed out. As this diſeaſe ſeldom happens without being attended by the other, it is moſt probable that they generally both ariſe from the ſame cauſe. The ſecond in theſe caſes may be an effect of the firſt. Both combine to haſten the loſs of the Tooth; but it ſometimes happens that they act ſeparately: for I have ſeen caſes where the

Gum

Gum was leaving the Teeth, and yet the Tooth was not in the leaſt protruded; on the other hand, I have ſeen caſes, where the Tooth was protruding, and yet the Gum kept its breadth; but where this is not the caſe, and the Gums give way, the Gums generally become extremely diſeaſed; and as they are ſeparated from both the Teeth and the Alveolar Proceſs, there is a very conſiderable diſcharge of matter from thoſe detached ſurfaces.

Though the waſting of the Alveoli at their mouths, and the filling up at their bottoms, are to be conſidered as diſeaſes, when they happen early in life; yet it would appear to be only on account of a natural effect taking place too ſoon; for the ſame thing is very common in old age*: and alſo, as this proceſs of filling up the bottom, and waſting of the mouths of the Alveolar Proceſſes, takes place in all ages, where a Tooth has been drawn, and the connection between the two parts is deſtroyed, this might lead us to ſuſpect, that the original cauſe of theſe diſeaſes may be a want of that perfect harmony, which is

* Vide Natural Hiſtory of the Teeth, page 7.

required

required between the Tooth and Socket, whereby a ſtimulus may be given in ſome degree ſimilar to the loſs of a Tooth; and by deſtroying that ſtimulus upon which the abſorption of the proceſs and the filling up of the ſocket depend, the natural diſpoſition may be reſtored. This laſt opinion is ſtrengthened by the following caſe.

One of the firſt inciſores of the upper jaw of a young lady was gradually falling lower and lower. She was deſirous of having a Tooth tranſplanted, which might better fit the ſhallow ſocket, as it was now become: ſhe conſulted me: I objected to this, fearing that the ſame diſpoſition might ſtill continue; in which caſe the new Tooth would be probably puſhed out in about half a year; that the time ſince the old one began to ſink, and a relief of ſo ſhort a continuance, would be all the advantage gained by the operation; but I obſerved at the ſame time, that the operation might have the effect of deſtroying the diſpoſition to filling up, ſo that the new Tooth might keep its ground. This idea turned the balance in favour of the operation; and it was performed. Time ſhewed that the reaſoning was juſt: the

Tooth

Tooth faſtened; and has kept in its ſituation for ſome years.

Theſe diſeaſes ariſe often from viſible cauſes. Any thing that occaſions a conſiderable and long continued inflammation in thoſe parts, ſuch particularly as a ſalivation, will produce the ſame effect. The ſcurvy alſo, when carried to a great height, attacks the Gums, and the Alveolar Proceſſes, which becomes a cauſe of the diſſolution of thoſe parts. This is moſt remarkable in the ſcurvy at ſea.

When the diſeaſe ariſes from theſe two laſt cauſes, the Gums are either affected with the ſame diſeaſe, together with the Alveolar Proceſſes, or they ſympathize with them. They ſwell, become ſoft and tender; and, upon the leaſt preſſure or friction, bleed very freely.

How far theſe diſeaſes can be prevented and cured, is, I believe, not known.

The practice hath been principally to ſcarify the Gums freely; and this with a view to faſten the Teeth made

made looſe by the diſeaſe, which has therefore generally made a conſiderable progreſs before even an attempt towards a cure has been made. This ſcarification has certainly a good effect in ſome caſes, the Teeth thereby becoming much faſter; but how far the Alveolar Proceſſes have been deſtroyed in ſuch inſtances, cannot be determined. Perhaps, only a general fullneſs of the attaching membrane, between the Tooth and the Proceſs, had taken place, as in a ſlight ſalivation, ſo as to puſh the Tooth a little way out of the bony ſocket; which having ſubſided by the plentiful bleeding, the Tooth of courſe becomes faſt. Or perhaps, by producing an inflammation of another kind, the firſt inflammation, or diſpoſition to inflame, is deſtroyed; which evidently appeared in the caſe of the young lady above mentioned.

If the above practice is unſucceſsful, and the Tooth continues to protrude, it will either become very troubleſome, or a great deformity. A fore Tooth may not, indeed, be at firſt ſo troubleſome as a Grinder; becauſe theſe Teeth frequently *overlop*; but it will be extremely diſagreeable to the eye.

If

If the cauſe cannot be removed, the effect muſt be the object of our attention. To file down the projecting part is the only thing that can be done; but care muſt be taken not to file into the cavity, otherwiſe pain, inflammation, and other bad conſequences, may probably enſue. This practice, however, will be very troubleſome, becauſe it will be difficult to file a looſe Tooth. At laſt the Tooth will drop out, which will put an end to all farther trouble.

If the Alveoli have really been deſtroyed, in thoſe caſes of looſe Teeth which have become firm again, it would be difficult to aſcertain whether they have a power of renewing themſelves, analogous to that power by which they firſt grow; or whether the faſtening be effected by a cloſing of the Gum and Proceſs to the Teeth. When the diſeaſe ariſes from the ſcurvy, the firſt attempt muſt be to cure that diſeaſe; and afterwards the above local treatment may be of ſervice.

Together with drawing blood from the Gums, aſtringents have always been uſed to harden them. But when the diſeaſe does not ariſe from a conſtitutional cauſe, which may be removed, (ſuch as the ſea-ſcurvy or ſalivation) but from a diſpoſition in the

parts themſelves, I have ſeen little relief given by them.

The tincture of myrrh, tincture of Peruvian bark, and ſea-water, are ſome of the applications which have been recommended.

In ſuch caſes I have ſeen conſiderable benefit from the uſe of the tincture of bark and laudanum, in the proportion of two parts of the tincture of bark to one of the laudanum; and this to be uſed frequently, and at each time to be kept in the mouth during ten, fifteen, or twenty minutes.

CHAP. III.

OF THE

DISEASES of the GUMS,

AND THE

CONSEQUENCES OF THEM.

SECT. I.

The Scurvy in the Gums.

(Vulgarly ſo called.)

THE Gums are extremely ſubject to diſeaſes, the ſymptoms of which, in an advanced ſtate of them, are in general ſuch as were deſcribed in the preceding chapter.

They ſwell, become extremely tender, and bleed upon every occaſion; which circumſtances being ſomewhat ſimilar to thoſe obſervable in the true Scurvy, the

diſeaſe has generally been called a Scurvy in the Gums.

But as this ſeems to be the principal way in which the Gums are affected, I ſuſpect, that the ſame ſymptoms may ariſe from various cauſes; as I have often ſeen the ſame appearances in children evidently of a ſcrofulous habit; and have alſo ſuſpected them in grown people: they likewiſe frequently appear in perſons, who are, in all other reſpects, perfectly healthy.

When the Gums firſt begin to have a tenderneſs, we may obſerve it firſt on their edges: the common ſmooth ſkin of the Gum is not continued to its very edge, but becomes at the edge a little rough like a border, and ſomewhat thickened. The part of the Gum, between two Teeth, ſwells, and often puſhes out like luxuriant fleſh, which is frequently very tender.

The inflammation is often carried ſo far as to make the Gums ulcerate; ſo that the Gums in many caſes have a common ulcer upon them; by which proceſs, a part of the Teeth are denuded. This is often on one part only,

only, often only on one jaw; while in ſome caſes it is on the whole Gums on both jaws.

In this caſe it often happens, that the Alveolar Proceſs diſappears, after the manner above deſcribed, *(ſee page 48)* by taking part in the inflammation, either from the ſame cauſe, or from ſympathy. In ſuch caſes there is always a very conſiderable diſcharge of matter from the inſide of the Gum, and Alveolar Proceſs, which always takes the courſe of the Tooth for its exit.

In many of theſe caſes we find, that while the Gums are ulcerating in one part, they are ſwelling and becoming ſpongy in another, and hanging looſe upon the Teeth; and this often takes place, where there is no ulceration in any part.

The treatment, proper in this diſeaſe, where the Gums become luxuriant, from a kind of tumefaction, is generally to cut away all the redundant ſwellings of the Gum. I have ſeen ſeveral inſtances, where this has ſucceeded; but ſtill I am inclined to think, that this is not the beſt practice; for it is not that an adventitious ſubſtance is thus removed, as in the caſe of luxuriant granulations, from a

fore,

ſore, but a part of the Gum itſelf is deſtroyed, in like manner as a part enlarged by inflammation may be reduced by the knife to its natural ſize; which would certainly be bad practice. I ſhould ſuſpect, that the good, ariſing from ſuch practice, is owing to the bleeding which takes place; eſpecially as I have found from experience, that ſimply ſcarifying the Gums has anſwered the ſame purpoſe. Where there are reaſons for ſuppoſing it to ariſe from a peculiarity in the conſtitution, the treatment ſhould be ſuch as will remove this peculiarity.

If the conſtitution is ſcorbutic, it muſt be treated with a view to the original diſeaſe. If ſcrofulous, local treatment, by wounding the parts, may do harm; but ſea-bathing, and waſhing the mouth frequently with ſea-water, are the moſt powerful means of cure that I know.

SECT.

SECT. II.

Callous Thickenings of the Gums.

THE Gums are alſo ſubject to other diſeaſes, abſtracted from their connection with the Alveoli and Teeth; which do not wholly belong to our preſent ſubject.

A very common one is the thickening of the Gum in ſome particular place, of a hard callous nature, ſimilar to an excreſcence. Many of theſe have a cancerous appearance, which deters the Surgeon from meddling with them; but in general, without reaſon.

They may be often removed by the knife, but not always. The bleeding, which follows, is generally ſo conſiderable, that it is frequently neceſſary to apply the actual cautery.

They

They ſometimes grow again, which ſubjects the patient to the ſame operation. I have known them extracted ſix times; but, in ſuch caſes, I ſuſpect that they really have a cancerous diſpoſition; at leaſt, it has been ſo in two caſes, which have fallen under my obſervation.

But here the ſkill of the Surgeon, rather than that of the Dentiſt, is required.

CHAP.

CHAP. IV.

OF

NERVOUS PAINS in the JAWS.

THERE is one diſeaſe of the Jaws which ſeems in reality to have no connection with the Teeth, but of which the Teeth are generally ſuſpected to be the cauſe. This deſerves to be taken notice of in this place, becauſe operators have frequently been deceived by it, and even ſound Teeth have ſometimes been extracted through an unfortunate miſtake.

This pain is ſeated in ſome one part of the Jaws. As ſimple pain demonſtrates nothing, a Tooth is often ſuſpected, and is perhaps drawn out; but ſtill the pain continues, with this difference however, that it now ſeems to be in the root of the next Tooth: it is then ſuppoſed either by the patient or the operator, that the wrong Tooth was extracted; wherefore, that

in which the pain now ſeems to be, is drawn, but with as little benefit. I have known caſes of this kind, where all the Teeth of the affected ſide of the Jaw, have been drawn out, and the pain has continued in the Jaw; in others, it has had a different effect, the ſenſation of pain has become more diffuſed, and has at laſt, attacked the correſponding ſide of the tongue. In the firſt caſe, I have known it recommended to cut down upon the Jaw, and even to perforate and cauteriſe it, but all without effect.

Hence it ſhould appear, that the pain, in queſtion, does not ariſe from any diſeaſe in the part, but is entirely a nervous affection.

It is ſometimes brought on, or increaſed, by affections of the mind, of which I once ſaw a remarkable inſtance in a young Lady.

It often has its periods, and theſe are frequently very regular.

The regularity of its periods gives an idea of its being a proper caſe for the bark, which however frequently fails.

I have

I have ſeen caſes of ſome years ſtanding, where the hemlock has ſucceeded, when the bark has had no effect; but ſometimes all attempts prove unſucceſsful. Sea bathing has been in ſome caſes of ſingular ſervice.

CHAP. V.

OF THE

EXTRANEOUS MATTER upon the TEETH.

THERE are parts of the Tooth, which lie out of the way of friction, viz. the angles made by two Teeth, and the ſmall indentation between the Tooth and Gum.

Into theſe places the juices are preſſed and there ſtagnate, giving them at firſt the appearance of being ſtained or dirty. A Tooth in this ſtage is generally clean for ſome way from its cutting edge, towards the gum, on account of the motion of the lips upon it, and the preſſure of the food, &c. It is alſo pretty clean cloſe to the Gum, from the motion of the looſe edge of the Gum upon that part, but this circumſtance is only obſervable in thoſe who have their Gums perfectly ſound; for in others, this looſe edge

of

of the Gum is either loſt, or no longer retains its free motion.

If art be not now uſed, as the natural motion of the parts is not ſufficient, the incruſtation encreaſing covers more and more of the Teeth. As maſtication generally keeps that part clear which is near to the edges and grinding ſurfaces; and as the motion of the lips in ſome meaſure retards its growth outwards, it accumulates on the parts above mentioned, till it riſes almoſt as high as the Gum; its growth being now retarded in that direction, it accumulates on the edge next to the Gum, ſo that in time it paſſes over the Gum, of which it covers a greater or leſs portion. When it has encreaſed ſo much as to touch the Gum, (which very ſoon happens, eſpecially in the angle between the Teeth) it produces ulceration of that part, and a train of bad conſequences. Often the Gums receding from this matter, become very tender and ſubject to hemorrhage.

The alveolar proceſſes frequently take part with the Gums, and ulcerate, ſo that the Teeth are left without their ſupport, and at laſt drop out, ſimilarly to the diſeaſes of theſe parts already deſcribed.

All

All our juices contain a conſiderable quantity of calcareous earth, which is diſſolved in them, and which is ſeparated from them upon expoſure, which continues mixed with the mucus; ſo that the extraneous matter conſiſts of earth and the common ſecreted mucus *.

This diſpoſition of the juices of the mouth to abound ſo much with earth, ſeems to be peculiar to ſome people, perhaps to ſome conſtitutions; but I have not been able to aſcertain what theſe are. We find perſons who ſeem to have nothing particular, either in conſtitution or way of life, ſo ſubject to this accumulation, that the common methods of prevention, ſuch as waſhing and bruſhing the Teeth, have not the deſired effect.

The diſpoſition is ſo ſtrong in ſome people, that the concretion forms on the whole body of the Tooth; I have ſeen it even on the grinding ſurface of the *molares*, and often two or three Teeth are cemented together with it. This I think could only happen to

* Vide Natural Hiſtory, page 125, in the Note, for a further deſcription of this.

thoſe

thoſe who ſeldom or never uſe theſe Teeth. It is very apt to accumulate on a Tooth the oppoſite of which is loſt.

I once ſaw a caſe of this kind, where the accumulation, which was on a grinder, appeared like a tumour on the inſide of the mouth, and made a riſing in the cheek, which was ſuppoſed by every one that felt it, to be a ſcirrhous tumour forming on the cheek; but it broke off and diſcovered what it was.

This accumulation is very apt to begin during a fit of ſickneſs, when the extraneous juices are allowed to reſt; and perhaps the juices themſelves may have at this time a greater tendency to produce the incruſting matter.

It may alſo ariſe from any circumſtance, which prevents a perſon from eating ſolids, whereby the different parts of the mouth have leſs motion on each other. Lying-in women are inſtances of this; not to mention that the aſſiſtance of art in keeping the Teeth clean is commonly wanting under ſuch circumſtances.

The

The adventitious ſubſtance, as was ſaid before, is compoſed of mucus or animal juices, and calcareous earth; the earth is attached to and cryſtalized upon the Tooth, and the mucus is intangled in theſe cryſtals.

The removal of this adventitious matter, is a part in which the dentiſt ought to be very cautious; he ſhould be perfectly maſter of the difference between the natural or original Tooth, and the adventitious matter; and he ſhould be ſenſible of the propriety of ſaving as much as poſſible of the Tooth, and at the ſame time take pains to remove all that which is not natural. Many perſons have had their teeth wholly ſpoiled by an injudicious treatment of them in this reſpect.

As the cauſe of this incruſtation is not either a known diſeaſe of the conſtitution, or of the parts, but depends on a property of the matter, ſecreted, ſimply as inanimate matter; the remedy of courſe becomes either mechanical or chemical.

The

The mechanical remedies are friction, filing, and picking. The firſt is ſufficient, when the Teeth are only beginning to be diſcoloured; or, when already clean, they may be thus kept clean. Various are the methods propoſed; to waſh them with cold water, and at the ſame time to rub them with a piece of cloth on the fore-finger, has been thought ſufficient by ſome; others have recommended the duſt of a burnt cork, burnt bread, &c. with a view to act with more power on the adventitious matter, than what can be applied by the means of a ſoft bruſh or cloth.

In caſes where this incruſtation has been more conſiderable, powders of various kinds have been employed, ſuch as tartar, bole, and many others.

Cream of tartar is often uſed, which at the ſame time that it acts mechanically, has likewiſe a chymical power, and diſſolves this matter.

Other mechanical means are inſtruments to pick, ſcrape, and file off the calcarious earth; theſe ſhould only be made uſe of when it is in large quantities, and

with great caution, as the Teeth may be ſomewhat looſe; or, a part of the Tooth may be broken off with the incruſtation.

The chymical means are ſolvents: theſe are either alkalies or acids; the alkaline ſalt will anſwer very well early in the diſeaſe; for the cruſt in the firſt ſtage conſiſts chiefly of mucus, which the alkali will remove very readily; but it ſhould not be uſed too freely, as it rather ſoftens the Gums, and makes them extremely tender.

Acids are alſo employed with ſucceſs, as they diſſolve the earth, but are attended with this diſadvantage, that they act with more force upon the Tooth itſelf, diſſolving part of it, which is to be avoided, if poſſible; for no part of a ſound Tooth can be ſpared.

We may obſerve that people who eat a good deal of ſalad or fruit, have their Teeth much cleaner than common; which is owing to the acids in thoſe fruits; and for the ſame reaſon people's Teeth are commonly cleaner in ſummer than winter, in thoſe countries where there

there is a great plenty of fruit. When the accumulation has been considerable, the Teeth and Gums will feel tender on the removal of this matter, and even be affected by cold air; but this will not be of long continuance.

CHAP. VI.

OF THE

IRREGULARITY of the TEETH.

AS that part of each jaw, which holds the ten fore-teeth, is exactly of the ſame ſize when it contains thoſe of the firſt ſet, as when it contains thoſe of the ſecond; and as theſe laſt often occupy a much larger ſpace than the firſt *, in ſuch caſes the ſecond ſet are obliged to ſtand very irregularly.

This happens much oftner in the upper-jaw, than in the lower; becauſe, the difference of the ſize of the two ſets is much greater in that jaw.

* Vide Natural Hiſtory, p. 101, 102. Pl. 6. fig. 2.

This

This irregularity is obſerved almoſt ſolely in the inciſores and cuſpidati; for they are the only Teeth which are larger than their predeceſſors.

It moſt frequently happens to the cuſpidati, becauſe they are often formed later than the bicuſpedes; in conſequence of which, the whole ſpace is taken up before they make their appearance: in ſuch caſes they are obliged to ſhoot forwards or outwards over the ſecond inciſor. However, it frequently happens to the inciſores, but ſeldom to ſuch a degree. This ariſes often from the temporary cuſpidatus of one or both ſides ſtanding firm. I have ſeen the irregularities ſo much as to appear like a double row.

The bicuſpedati generally have ſufficient room to grow, becauſe even more ſpace, than what they can occupy, is kept for them by the temporary grinders *. This however is not univerſally the caſe; for I have ſeen where the bicuſpidati were obliged to grow out of the circle, very probably from their being later in growing than common.

* Vide Natural Hiſtory, page 83.

That

That it is from want of room in the jaw, and not from any effect that the firſt ſet produce upon them is evident; firſt, becauſe in all caſes of irregularity we find that there is really not room in the Jaw, to allow of placing all the Teeth properly in the circle; ſo that ſome are neceſſarily on the outſide of the circle, others within it, while others are turned with their edges obliquely as it were, warped; and ſecondly, becauſe the bicuſpides are not out of the circle, although they are as much influenced by the firſt ſet as any of the others.

As they are not influenced by the firſt ſet, it cannot be of any ſervice to draw the firſt poſſeſſor; for that gives way in the ſame proportion as the other advances. As the ſucceeding Tooth however is broader, it often interferes with a ſhedding Tooth next to it, the fang of which not being influenced by the growth of its own ſucceeding Tooth, it does not decay in proportion as the other advances, and therefore the drawing of the adjoining ſhedding Tooth is often of ſervice *.

* Vide Nat. Hiſt. page 107.

In

In caſes of conſiderable irregularity for want of room, a principal object is to remove thoſe which are moſt out of their place, and thereby procure room for the others which are to be brought into the circle.

To extract an irregular Tooth would anſwer but little purpoſe, if no alteration could be made in the ſituation of the reſt; but we find that the very principle upon which Teeth are made to grow irregularly, is capable, if properly directed, of bringing them even again. This principle, is the power which many parts (eſpecially bones) have of moving out of the way of mechanical preſſure.

The irregularity of the Teeth is at firſt owing to mechanical preſſure; for one Tooth getting the ſtart of another, and fixing firmly in its place, becomes a reſiſtance to the young, looſe, forming Tooth, and gives it an oblique direction. The ſame principle takes place in a completely formed Tooth, whenever a preſſure is made upon it. Probably a Tooth might by ſlow degrees be moved to any part of the mouth, for I have ſeen the cuſpedati preſſed into the place of the inciſores.

ciſores. However it is obſerved, that the Teeth are eaſier moved backwards than forwards, and when moved back that they are permanent, but often, when moved forwards, that they are very apt to recede.

The beſt time for moving the Teeth is in youth, while the jaws have an adapting diſpoſition; for, after a certain time, they do not ſo readily ſuit themſelves to the irregularity of the Teeth. This we ſee plainly to be the caſe, when we compare the loſs of a Tooth at the age of fifteen years, and at that of thirty or forty. In the firſt caſe we find, that the two neighbouring Teeth approach one another, in every part alike, till they are cloſe; but in the ſecond, the diſtance in the jaw, between the two neighbouring Teeth, remains the ſame, while the bodies will in a ſmall degree incline to one another from want of lateral ſupport *.

And this circumſtance of the bodies of the Teeth yielding to preſſure upon their baſe, ſhews that, even in the adult, they might be brought nearer to one another by art properly applied.

* Vide Nat. Hiſt. Plate XVI. fig. 1. *a*, *b*, *c*.

As

As the operation of moving the Teeth is by lateral preſſure upon their bodies, theſe bodies muſt firſt have paſſed through the gum ſufficiently for a hold to be taken.

The beſt time ſeems to be, when the two grinders of the child have been ſhed; for at this time a natural alteration is taking place in that part of the jaw.

The means of making this preſſure I ſhall only ſlightly deſcribe, as they will greatly vary according to circumſtances, ſo conſiderably indeed, that ſcarcely two caſes are to be treated alike, and in general the dentiſts are tolerably well acquainted with the methods.

In general, it is done with ligatures or plates of ſilver. The ligatures anſwer beſt when it is only required to bring two Teeth cloſer together, which are pretty much in the circle. The trouble attending this is but trifling, as it is only that of having them tied once a week or fortnight.

Where Teeth, growing out of the circle, are to be brought into it, curved ſilver plates, of a proper con-

ſtruction, muſt be uſed. Theſe are generally made to act on three points, two fixed points on the ſtanding Teeth, and the third on the Tooth which is to be moved. That part of the plate, which reſts on the two ſtanding Teeth, muſt be of a ſufficient length for that purpoſe, while the curved part is ſhort, and goes on the oppoſite ſide of the Tooth to be moved. Its effect depends very much on the attention of the patient, who muſt frequently preſs hard upon it with the Teeth of the oppoſite jaw; ſo that this method is much more troubleſome to the patient than the ligature.

It is impoſſible to give abſolute directions what Tooth or Teeth ought to be pulled out. That muſt be left to the judgment of the operator; but the following general hints may be of ſervice.

1. If there is any one Tooth very much out of the row, and all the others regular, that Tooth may be removed, and the two neighbouring ones brought cloſer together.

2. If there are two or more Teeth of the ſame ſide very irregular, (as for inſtance, the ſecond inciſor and cuſpi-

cuſpidatus) and it appears to be of no conſequence, with reſpect to regularity, which of them is removed, I ſhould recommend the extraction of the fartheſt back of the two, viz. the cuſpidatus; becauſe, if there ſhould be any ſpace, not filled up, when the other is brought into the row, it will not be ſo readily ſeen.

3. If the above-mentioned two Teeth are not in the circle, but ſtill not far out of it, and yet there is not room for both; in ſuch a caſe I would recommend the extraction of the firſt bicuſpis, although it ſhould be perfectly in the row, becauſe the two others will then be eaſily brought into the circle; and, if there is any ſpace left, it will be ſo far back as not to be at all obſervable.

The upper jaw is often rather too narrow from ſide to ſide, near the anterior part which ſupports the fore Teeth, and projects forwards conſiderably over the lower, giving the appearance of the rabbit-mouth, although the Teeth be quite regular in the circle of the jaw.

In ſuch a caſe it is neceſſary to draw a bicuſpis of each ſide, by which means the forepart of the circle

will fall back; and if a croſs bar was to be ſtretched from ſide to ſide acroſs the roof of the mouth, between cuſpis and cuſpis, it would widen the circle. The fore Teeth might alſo be tied to this bar, which would be a means of aſſiſting nature in bringing them back. This has been practiſed, but it is troubleſome.

As neither the bodies nor the fangs of the Teeth are perfectly round, we find that this circumſtance often becomes a cauſe of their taking a twiſt; for, while growing, they may preſs with one edge only on the completely formed Tooth; by which means they will be turned a little upon their center.

The alteration of theſe is more difficult than of the former, for it is, in general, impoſſible to apply, ſo long and conſtantly as is neceſſary for ſuch an operation, any preſſure that has the power of turning the Tooth upon its center. However, in the inciſores, it may be done by the ſame powers which produce the lateral motion; but where theſe cannot be applied, as is frequently the caſe, the Tooth may be either pulled out entirely, and put in again even, or it may be twiſted

twiſted round ſufficiently to bring it into a proper poſition, as hath been often practiſed.

It may not be improper, in this place, to take notice of a caſe which frequently occurs. It is a decay of the firſt adult grinder at an early age, viz. before the temporary grinders are ſhed, and before the ſecond grinder of the adult has made its appearance through the gum. In this caſe, I would recommend removing the diſeaſed Tooth immediately, although it may occaſion no kind of trouble; for, if it be drawn before the temporary grinders are ſhed, and before the ſecond adult grinder has cut the gum, it will in a ſhort time not be miſſed; becauſe the bicuſpis of that ſide will fall a little back, and the ſecond and third grinders will come a little forward; by which means the ſpace will be filled up, and theſe Teeth will be well ſupported. Beſides, the removal of this Tooth, will make room for the fore Teeth, which is often very much wanted, eſpecially in the upper jaw.

CHAP. VII.

OF

IRREGULARITIES between the TEETH and JAW.

CERTAIN diſproportions, between the Teeth and Jaw, ſometimes occur, one of which is, when the body of the lower jaw is not of ſufficient length for all the Teeth. In ſuch caſes, the laſt grinder never gets perfectly from under the coronoide proceſs, its anterior edge only being uncovered; and the gum, which ſtill in part lies upon the Tooth, is rubbed againſt the ſharp points of the Tooth, and is often ſqueezed between the Tooth upon which it lies, and the correſponding one of the upper jaw. This occaſions ſo much uneaſineſs to the patient, that it becomes neceſſary to relieve the gum, if poſſible, by dividing it freely in ſeveral places, that it may ſhrink and leave this ſurface of the Tooth wholly uncovered. If this does not anſwer, which is ſometimes the caſe, it is adviſeable to draw the Tooth.

Some-

Sometimes, although but ſeldom, an inconvenience ariſes from the dentes ſapientiæ being in the upper Jaw, and not in the lower; theſe Teeth preſſing upon the anterior part of the root of the coronoide proceſs, when the mouth is ſhut; for the coronoide proceſſes are farther forwards in ſuch caſes, than when the lower Jaw alſo has its dentes ſapientiæ; in ſhort, the exact correſpondence between the two Jaws is not kept up.

In ſuch caſes I know of no other remedy, but the extraction of the Tooth.

OF SUPERNUMERARY TEETH.

WHEN there are Supernumerary Teeth *, it will, in general, be proper to have them drawn; for they are commonly either troubleſome, or disfigure the mouth.

* Vide Natural Hiſtory, page 105.

CHAP.

CHAP. VIII.

Of the UNDER JAW.

IT is not uncommon to find the lower Jaw projecting too far forwards, ſo that its fore Teeth paſs before thoſe of the upper Jaw, when the mouth is ſhut*; which is attended with inconvenience, and disfigures the face.

This deformity can be greatly mended in young people. The Teeth in the lower Jaw can be gradually puſhed back in thoſe, whoſe Teeth are not cloſe, while thoſe in the upper can be gently brought forward; which is by much the eaſieſt operation.

Theſe two effects are produced by the ſame mechanical powers. While this poſition of the Jaw is only in a ſmall degree, ſo that the edges of the under

* Vide Natural Hiſtory, page 70.

Teeth

Teeth can be by the patient brought behind thoſe of the upper, it is in his own power to encreaſe this, till the whole be completed; that is, till the grinders meet; and it is not neceſſary to go farther. This is done by frequently bringing the lower Jaw as far back as he can, and then ſqueezing the Teeth as cloſe together as poſſible.

But when it is not in the perſon's power to bring the lower Jaw ſo far back, as to allow the edges of its fore Teeth to come behind thoſe of the upper, artificial means are neceſſary.

The beſt of theſe means is an inſtrument of ſilver, with a ſocket or groove ſhaped to the fore Teeth of the lower jaw to receive them, ſo as to become faſt to them, and ſloped off as it riſes to its upper edge, ſo as to riſe behind the fore Teeth in the upper jaw in ſuch a manner, that, upon ſhutting the mouth, the Teeth of the upper jaw may catch the anterior part of the ſlanting ſurface, and be puſhed forward with the power of the inclined plane. The patient, who wears ſuch an inſtrument, muſt frequently ſhut his mouth with this view.

Theſe need not be continued longer than till the edges of the lower Teeth can be got behind thoſe of the upper; for it is then within the power of the patient, as in the firſt ſtated caſe.

CHAP.

CHAP. IX.

OF

DRAWING the TEETH.

THE extraction of Teeth is, in ſome caſes, an operation of conſiderable delicacy, and, in others, no operation is leſs difficult.

As this is often not thought of till an inflammation has come on, it becomes an object of conſideration whether it be proper to remove the Tooth while that inflammation continues, or to wait till it has ſubſided. I am apt to believe it is better to wait even till the parts have perfectly recovered themſelves, becauſe the ſtate of irritation renders them more ſuſceptible of pain. The contrary practice might alſo appear reaſonable, for by removing the Tooth it might be imagined that we ſhould remove the cauſe; but

when the inflammation has once begun, the effect will go on independently of the cauſe; and to draw the Tooth, in ſuch a ſituation, is rather to produce a freſh cauſe, than to remove the preſent. Of this I think an inſtance has occurred to me. However, moſt Teeth are drawn in the height of inflammation; and, as we do not find any miſchief from the operation, it is perhaps better to do it when the reſolution of the patient is the greateſt. The ſenſibility of the mind may even be leſs at this time.

Teeth are eaſy or difficult of extraction, according as they are faſt or looſe in their ſockets; in ſome degree according to the kind of Tooth, and alſo, in ſome degree, with reference to their ſituation *.

They are naturally ſo faſt as to require inſtruments; and the moſt cautious and dextrous hand; and yet are ſometimes looſe enough to be pulled out by the fingers.

When the ſockets and gums are conſiderably decayed, and the Tooth or Teeth very looſe, it would in

* For farther directions, vid. Nat. Hiſt. page 122.

moſt

moſt caſes be right to perform extraction ; for when they are allowed to ſtay, and perhaps are kept in their proper place by being tied to the neighbouring Teeth, they then act upon the remaining gum and ſocket as extraneous bodies, producing ulceration there, and making thoſe parts recede much farther than they naturally would have done, if the Tooth had been drawn earlier; which produces two bad effects, it weakens the lateral ſupport of the two neighbouring Teeth, and it renders it more difficult to fix an artificial Tooth. But unleſs theſe two laſt circumſtances are forcibly impreſſed upon the patient, it is hardly poſſible to perſuade him to conſent to the loſs of a Tooth while it has any hold, eſpecially a tooth which appears ſound.

The extraction ſhould never be done quick; for this often occaſions great miſchief, breaking the Tooth or jaw; on the ſame principle, as a bullet, going againſt an open door with great velocity, will paſs through it, but, with little velocity, will ſhut it.

This

This caution is moſt neceſſary in adults, or in the permanent Teeth *; for, in young ſubjects, where there are only the temporary Teeth †, the jaw, not being ſo firm, the Tooth is not in much danger of being broken ‡.

It is a common practice to divide the gum from the Tooth before it is drawn, which is attended with very little advantage; becauſe at beſt it can only be imperfectly done, and that part of the gum, which adheres to the Tooth, decays when it is loſt. But if ſuch a ſeparation, as can be made, ſaves any pain in the whole of the operation, I ſhould certainly recommend it; and at leaſt in ſome caſes, it might prevent the gum from being torn. It is alſo a common practice, to cloſe the gum as it is termed; this is more for ſhew than uſe; for the gum cannot be made ſo cloſe as to unite by the firſt intention; and therefore the cavity

* Vide Natural Hiſtory, page 83.

† Vide Nat. Hiſt. page 98, fig. XV.

‡ I muſt do Mr. Spence the juſtice to ſay, that this method appears to be peculiar to him, and that he is the only operator I ever knew, who would ſubmit to be inſtructed, or even allow an equal in knowledge; and I muſt do the ſame juſtice to both his ſons.

from

from which the Tooth came, muſt ſuppurate like every other wound. But, as the ſenſations of theſe parts are adapted to ſuch a loſs ; and, as a proceſs very different from that which follows the loſs of ſo much ſubſtance in any other part of the body, is to take place; the conſequent inflammations and ſuppurations are not ſo violent *. We may be allowed to call this a natural operation which goes on in the gum and alveoli, and not a violence; as we ſee that the delivery of a young animal before its time, which is ſimilar to the drawing of a fixed Tooth, in happening before all the containing parts are prepared for the loſs, produces conſiderable local violence, without doing proportionable miſchief. Therefore, in general it is very unneceſſary to do any thing at all to the gum.

There are ſome particular circumſtances, which naturally, and others which accidentally attend and follow the drawing of Teeth; but they are in general of no great conſequence.

* Vide Natural Hiſtory, on decay of the Alveoli, page 7.

Bleed-

There follows a bleeding from the veſſels of the ſocket, and thoſe paſſing between it and the Teeth †. This commonly is but triſling; however inſtances have occurred, where it has been very conſiderable, and the aukwardneſs of the ſituation makes it very difficult to ſtop it. In general it will be ſufficient to ſtuff the ſocket with lint, or lint dipped in the oil of turpentine, and to apply a compreſs of lint, or a piece of cork thicker than the bodies of the adjacent Teeth, ſo that the Teeth in the oppoſite jaw may keep up a preſſure.

It has been adviſed to ſtuff into the ſocket ſome ſoft wax, on a ſuppoſition that it would mould itſelf to the cavity, and ſo ſtop the bleeding; this perhaps may ſometimes anſwer better than the other method, and therefore ſhould be tried when that fails.

It is ſcarcely poſſible to draw ſome Teeth without breaking the alveolar proceſſes. This in general is but of little conſequence, becauſe from the nature of the union between the Teeth and ſockets, theſe laſt can ſcarcely be broken farther than the points of the fang,

† Vide Natural Hiſtory, page 41, 42, 43. Pl. XII.

and

and in very few caſes ſo far ; therefore little miſchief can enſue, as the fracture extends no farther than the part of the ſocket which will naturally decay after the loſs of the Tooth ; and that part, which does not decay, will be filled up as a baſis for the gum to reſt upon. It has been ſuppoſed that the ſplinters do miſchief. I very much doubt this ; for if they are not ſo much detached as to loſe the living principle, they ſtill continue part of our body, and are rounded off at their points as all ſplinters are in other fractures, and particularly here, for the reaſons already aſſigned, viz. becauſe this part has a greater diſpoſition for waſting. And if they are wholly detached, they will either come away before the gum contracts entirely ; or, after it is cloſed, will act as an extraneous body ; form a ſmall abceſs in the gum ; and come out.

It ſometimes happens, that the Tooth is broken, and its point, or more of the fang is left behind, which is very often ſufficient to continue the former complaints ; and therefore it ſhould be extracted, if it can be done, with care. If it cannot be extracted, the gum will in part grow over it ; and the Alveoli

will decay as far as where it is. The decaying principle of the ſocket will produce the diſpoſition to fill up at the bottom, whereby the ſtump will be puſhed out; but, perhaps, not till it has given ſome fits of the Tooth-ach. However, this circumſtance does not always become a cauſe of the Tooth-ach.

TRANSPLANTING TEETH.

ALTHOUGH this operation is in itſelf a matter of no difficulty, yet, upon the whole, it is one of the niceſt of all operations, and requires more chirurgical and phyſiological knowledge than any that comes under the care of the dentiſt. There are certain cautions neceſſary to be obſerved, eſpecially if it be a living Tooth which is to be tranſplanted; becauſe in that caſe it is meant to retain its life, and we have no great variety of choice. Much likewiſe depends upon the patient: he ſhould apply early, and give the dentiſt all the time he thinks neceſſary to get a ſufficient number of Teeth that appear to be of a proper ſize, &c. Likewiſe

wiſe he muſt not be impatient to get out of his hands before it is adviſeable.

The *inciſores*, *cuſpidati*, and *bicuſpides*, can alone be changed, becauſe they have ſingle fangs. The ſucceſs is greateſt in the *inciſores* and *cuſpidati* than the *bicuſpides*; theſe laſt having frequently the ends of their fangs forked, from which circumſtance the operation will become leſs perfect.

It is hardly poſſible to tranſplant the grinders, as the chance of fitting the ſockets of them is very ſmall. When indeed a grinder is extracted, and the ſocket ſound and perfect, the dentiſt may, perhaps, be able to fit it by a dead Tooth.

OF THE

STATE of the GUMS and SOCKETS.

THE firſt object of attention is the Sockets and Gums of the perſon who is to have the freſh Tooth. If the

Tooth, which is to be removed, be not wholly diſeaſed, there is great probability that the Socket will be as ſound and complete as ever; but if the body of the Tooth has been deſtroyed ſome time, and the fang has been in the ſtate of what is commonly called a ſtump, it has moſt probably begun to decay on its outer ſurface and point; in which caſe the Socket will be filled up in the ſame proportion; if ſo, there is no poſſibility of ſucceſs. But as in the operation of tranſplanting, the diſeaſed Tooth is to be firſt drawn, it will ſhew the ſtate of the Socket; and the Scion * Tooth is to be left or drawn, according to the appearance on the diſeaſed one.

If the appearance be not favourable, and it therefore be not probable that the Scion Tooth can be introduced, ſo as to unite in the place of the ſtump, I would recommend to every dentiſt to have ſome dead Teeth at hand, that he may have a chance to fit the

* As the tranſplanting of Teeth is very ſimilar to the ingrafting of trees, I thought that term might be transferred from gardening to ſurgery, finding no other word ſo expreſſive of the thing.

Socket.

Socket. I have known theſe ſometimes laſt for years, eſpecially, when well ſupported by the neighbouring Teeth. Indeed this very practice is recommended by ſome dentiſts in preference to the other. But even this ſhould not be attempted, unleſs the Socket is ſound and pretty large, as the Tooth can otherwiſe have but very little hold.

Whenever there are Gum Boils, I would not recommend tranſplanting, as there is always in ſuch caſes a diſeaſed Socket, although the diſeaſe has originated in the Tooth. In one or two inſtances, indeed, which I have ſeen, the Boil has been cured by ſuch an operation.

If the Gums are diſeaſed, and become ſpongy, as has been deſcribed, it will be very improper to tranſplant, as there will be but little chance of ſucceſs; alſo, if the Sockets have a diſpoſition to waſte, and the Tooth becomes in ſome degree looſe; in ſhort, the Sockets and Gums ſhould be perfectly ſound. No perſon ſhould have a Tooth tranſplanted, while taking mercury, even although the Gums are not affected by it

at

at the time ; for they may become affected by that medicine before the Tooth is fixed. I would carry this ſtill farther : no one ſhould have a Tooth tranſplanted, who has any complaint that may ſubject him to the taking of mercury before the Tooth is well fixed. For this reaſon, thoſe who have Teeth tranſplanted, ought particularly to avoid for ſome time the chance of contracting any complaint, for the cure of which mercury may be neceſſary.

I would not recommend tranſplanting, even where mercury has been taken lately. How ſoon mercury may be taken after a Tooth has been tranſplanted, is not eaſily aſcertained. I have known it fail from this cauſe, (as it ſeemed) after ſix weeks, where there was every reaſon to ſuppoſe that it might have been attended with ſucceſs.

Of the Age of the Perſon who is to have the SCION TOOTH.

THE Socket ſhould be of its full ſize, and one or two grinders on each ſide of each jaw ſhould be full grown,

grown, to keep the two jaws at a proper diſtance, which will allow the tranſplanted Tooth to be undiſturbed by the motion of the jaw while faſtening. This will be at the age of eighteen or twenty years.

It ſometimes, however, happens, that a fore Tooth decays before this age, and even before it is completely formed; and therefore all the above mentioned advantages cannot be had. In ſuch caſes, it is not very material whether tranſplanting is practiſed or not, as ſimply to draw the diſeaſed Tooth, will in moſt caſes be ſufficient; for the two neighbouring Teeth may be brought together, ſo as to fill up the ſpace, the others following in a leſs degree, as has been already obſerved upon irregularities of the Teeth.

OF THE

SCION TOOTH.

THE Scion Tooth, or that which is to be tranſplanted, ſhould be a full grown young Tooth: young, becauſe

becauſe the principle of life and union is much ſtronger in ſuch than in old ones.

It will be ſcarcely neceſſary to obſerve, that the new Teeth ſhould always be perfectly ſound, and taken from a mouth which has the appearance of that of a perſon ſound and healthy; not that I believe it poſſible to tranſplant an infection of any kind from the circulating juices; although we know from experience that it may be done by a matter ſecreted from them. The Scion Tooth ſhould be leſs than what the Tooth was, the place of which it is to ſupply. This cannot at firſt be known with certainty, but it may in moſt caſes be nearly aſcertained; and that is by judging from the ſizes of the bodies of the two Teeth; but as the fangs do not always bear an exact proportion to the body, it ſometimes happens that this method fails. Alſo it is not always in our power to judge after this manner; for in ſome caſes the body of the Tooth of the perſon who is to have one tranſplanted, ſhall be quite deſtroyed, the fang only remaining: in theſe caſes we muſt judge from its correſpondent on the oppoſite ſide; but even that Tooth is ſometimes deſtroyed.

It has been ſuppoſed, that we run no riſk by taking the Scion Tooth from a young ſubject; but this is no ſecurity, for a compleat Tooth is of the ſame ſize in the young as the old.* To remedy this inconvenience as much as poſſible, the Scion Tooth ſhould be that of a female, for female Teeth are in general ſmaller than thoſe of men; but the inconvenience ſtill remains, whenever a female is the ſubject of this operation. Some women have ſuch ſmall Teeth, that it is almoſt impoſſible to fit them. When the fang of the Scion Tooth is larger than that which it is intended to ſupply, it muſt be made ſmaller, and only in that part where it exceeds. But the neceſſity of this ſhould be avoided, if poſſible; for a Tooth that is filed has loſt all thoſe inequalities which allow it to be held much faſter. If, however, ſome part muſt be removed, it ſhould be done ſo as to imitate the old Tooth as much as poſſible. The beſt remedy is to have ſeveral people ready, whoſe Teeth in appearance are fit; for if the firſt will not anſwer, the ſecond may. I am perſuaded this operation has failed, from a Tooth being

* Vide Natural Hiſtory, page 110, on the Growth of Teeth.

forced in too tight; for let us reflect what must be the consequence of such practice. A part of the soft covering of the Tooth, or lining of the Socket, is squeezed between two hard bones, so that all circulation of juices is prevented; a mortification in that part takes place; and in consequence of that a Gum Boil, and the loss of all union between Tooth and Socket; so that the Tooth drops out.

It will be hardly necessary to mention, that the sooner the Scion Tooth is put into its place the better, as delay will perpetually lessen the power upon which the union of the two parts depends *.

* Vide Nat. Hist. of Teeth, page 126, 127, and 128, for an explanation of the principle upon which the success of this operation depends.

Of replacing a ſound TOOTH, when drawn by miſtake.

IT ſometimes happens, that a Tooth is drawn on an idea that it is diſeaſed, becauſe it gives pain, but appears after the extraction to be perfectly ſound. In ſuch a caſe I would recommend the replacing it, that there may be no loſs by the operation; and the ſeat of the pain will probably be removed to the next Tooth. A Tooth beat out by violence, ſhould be replaced in the ſame manner. This ought to be done as ſoon as poſſible; however, I would even recommend the experiment twenty-four hours after the accident, or as long as the Socket will receive the Tooth, which may be for ſome days.

If the Tooth be replaced at any time before its life is deſtroyed, it will re-unite with the cavity of the Socket, and be as faſt as ever.

No Tooth is excepted from this practice; for although in the Grinders there are more fangs than one, yet

theſe fangs will as readily go into their reſpective Sockets as one fang would; and moſt probably when the Tooth has been beat out, the Sockets are enlarged by their giving way.

However, the Grinders are not ſo ſubject to ſuch accidents as the fore Teeth, both from their ſituation, and from their firmneſs in the Sockets.

Where a Tooth has been only looſened, or ſhoved out in part, the patient muſt not heſitate, but replace it immediately. As a proof of the ſucceſs to be expected from replacing Teeth, I will relate the following caſe.

A gentleman had his firſt *bicuſpis* knocked out, and the ſecond looſened. The firſt was driven quite into his mouth, and he ſpit it out upon the ground; but immediately picked it up, and put it into his pocket. Some hours afterwards he called upon me, mentioned the accident, and ſhewed me the Tooth. Upon examining his mouth, I found the ſecond *bicuſpis* very looſe, but pretty much in its place. The Tooth, which had been knocked out, was not quite dry, but very dirty, having dropped on the ground, and having been ſome time in

his

his pocket. I immediately put it into warm water, let it ſtay there to ſoften, waſhed it as clean as poſſible, and then replaced it, firſt having introduced a probe into the Socket to break down the coagulated blood which filled it. I then tied theſe two Teeth to the firſt grinder, and the *cuſpidatus* with ſilk, which was kept on ſome days, and then removed. After a month they were as faſt as any Teeth in the head; and, if it were not for the remembrance of the circumſtances above related, the gentleman would not be ſenſible that his Teeth had met with any accident. Four years have now paſſed ſinee it happened.

Of tranſplanting a dead TOOTH.

THE inſertion of a dead Tooth has been recommended, and I have known them continue for many years. If this always ſuceeded as well as the living, I would give it the preference, becauſe we are much more certain of matching them, as a much greater variety of dead Teeth can be procured than of living ones. But they do not always retain their colour, but are ſuſceptible of ſtain. However, I have known them laſt for years without any alteration; and ſome have appeared

peared rather to acquire a tranſparency, which dead Teeth in general have not.

Of the immediate faſtening of a tranſplanted TOOTH.

WHEN a Tooth has been tranſplanted, the next thing to be done is to fix it in that poſition in which it is intended to remain; that is in general to the two neighbouring Teeth, by means of ſilk or ſea weed. If it is an *inciſor* or *cuſpidatus*, the ſilk ſhould firſt be tied to the neck of one of the neighbouring Teeth, as near the gum as poſſible; then the two ends of the ſilk ſhould be brought round upon the body of the Scion Tooth, but not ſo near the gum as in the former, and tied there; then it ſhould be brought round the neck of the other neighbouring Tooth, as near the gum as poſſible, as in the firſt, and tied there. The reaſon of the difference of the heights of the ſilk recommended, muſt appear evident, it being our intention to keep the Tooth cloſe to the bottom of the Socket.

If the tranſplanted Tooth be a *bicuſpis*, the ſame mode of tying may be followed; but the ſilk may be brought over its grinding ſurface between the two points, by which

which it will be better confined than in any other way. It ſometimes happens, that the body of the Scion Tooth is either too long, too thick, or in ſuch a poſition as to be preſſed upon by the Teeth of the oppoſite jaw. Great care ſhould be taken to prevent this, as the oppoſite Teeth conſtantly oppoſe the faſtening of thoſe which are tranſplanted, in every motion of the jaw. To remedy this inconvenience, we have recommended ſmaller Teeth than thoſe loſt; but even when they are of a proper ſize in other reſpects, they ſhall in ſome caſes ſtill touch the oppoſite Teeth. When this ariſes from length of the Tooth, a ſmall portion may be filed off from the cutting edge with great ſafety. If it is owing to the thickneſs of the Scion Tooth, and in the upper jaw, ſome part may be filed off the hollow or concave ſurface of the Tooth, where the oppoſite touch. When it is owing to the poſition of the Teeth, the ſame thing may be done with propriety. By attending to this circumſtance in the tying, this inconvenience may in many caſes be prevented; however, if it ſhould not be in the power of the dentiſt to prevent it by the above mentioned method, then he ſhould bring them forwards by tying them to a ſilver plate, a little more bent than the circle of the Teeth,

and

and reſting at each end upon the neighbouring Teeth.

Where a Tooth does not exactly fit, but is too ſhort, then there ariſes a difficulty with the patient whether he ought to conſult propriety or beauty. The Tooth ſhould be as much in the Socket as it can be with eaſe; for, although in that caſe it is too ſhort, appearances muſt give way.

The patient muſt now finiſh the reſt. He muſt be particularly attentive at firſt, and give it as little motion as poſſible. In many caſes a foreneſs will continue ſome days, and the gums will ſwell; in others there will neithe rbe foreneſs nor ſwelling.

The patient muſt take great care not to catch cold, or expoſe himſelf to any of the other common cauſes of fever; for ſuch accidents are very likely to prevent the ſucceſs of this operation. This caution is more neceſſary in the winter, than the ſummer.

The Tooth in ſome will begin to be faſt in a few days, and the gum will cling cloſe to it; while, in others, many weeks will paſs before this happens; though the Tooth may become fixed at laſt.

I have

I have ſeen the tranſplanted Tooth come a little way out of the Socket; and, without any art being uſed, retire into it as far as at firſt. The ſilk is to be removed ſooner or later, according as the Tooth is more or leſs faſt; in ſome people after a fortnight, in others not till ſome months after the operation.

This operation, like all others, is not attended with certain ſucceſs. It ſometimes happens that the two parts do not unite; and in ſuch caſes the Tooth often acts as an extraneous body *, and inſtead of faſtening, the Tooth becomes looſer and looſer: the gum ſwells, and a conſiderable inflammation is kept up, often terminating in a Gum-Boil. In ſome caſes, where it is alſo not attended with ſucceſs, there are not theſe ſymptoms: the parts appear pretty ſound, only the Teeth do not faſten, and ſometimes drop out.

* I ſay often, becauſe I do not ſuppoſe that it always acts as an extraneous body; becauſe we know that dead Teeth have ſtood for years, without affecting the Sockets or Gums in the leaſt. We may therefore ſuppoſe, that it is ſometimes the caſe with tranſplanted living Teeth.

It alſo happens, that tranſplanted Teeth have a very ſingular operation performed on them while in the Socket; the living Socket and Gum finding this body kept in by force, ſo that they cannot puſh it out, ſet about another mode of getting rid of it, by eating away the fang till the whole is deſtroyed, exactly ſimilar to the waſting of the fangs of the temporary Teeth in the young ſubject*.

I have all along ſuppoſed, that where this practice is attended with ſucceſs, there is a living union between the Tooth and Socket, and that they receive their future nouriſhment from this new maſter. My reaſons for ſuppoſing it were founded on experiments on other parts †, in animals, and alſo obſervations made on the practice itſelf: for firſt I obſerved that they kept their colour, which is very different from that of a dead Tooth; for a living Tooth has a degree of tranſparency, while a dead one is of an opaque chalky white.

Secondly, there are inſtances of their becoming diſeaſed, in the ſame manner as an original living

* Vide Natural Hiſtory, page 98, plate X. fig. 2.

† Vide Natural Hiſtory, page 126.

Tooth;

Tooth; at leaſt the following caſe favours ſtrongly this opinion.

In *October*, 1772, a gentleman, of the city of *London*, had a Tooth tranſplanted, which was perfectly ſound, and fixed in its new Socket extremely well; about a year and a half after, two ſpots were obſerved on the fore part of the body of the Tooth, which threatened a decay; they were exactly ſimilar to ſpecks, or the firſt appearance of decay, which come upon natural living Teeth. Pain is alſo ſometimes felt in the tranſplanted Tooth.

But what puts it beyond a doubt is, that a living Tooth, when tranſplanted into ſome living part of an animal, will retain its life; and the veſſels of the animal ſhall communicate with the Tooth; as is ſhewn by the following experiments.

I took a ſound Tooth from a perſon's head; then made a pretty deep wound with a lancet into the thick part of a cock's comb; and preſſed the fang of the Tooth into this wound, and faſtened it with threads paſſed through

other parts of the comb. The cock was killed ſome months after; and I injected the head with a very minute injection: the comb was then taken off, and put into a weak acid, and the Tooth being ſoftened by this means, I ſlit the comb and tooth into two halves, in the long direction of the Tooth. I found the veſſels of the Tooth well injected, and alſo obſerved that the external ſurface of the Tooth adhered every where to the comb by veſſels, ſimilar to the union of a Tooth with the Gum and Sockets*.

* I may here juſt remark, that this experiment is not generally attended with ſucceſs. I ſucceeded but once out of a great number of trials.

Of

DENTITION.

TEETH, at their firſt formation, and for ſome time while growing, are completely incloſed within the Sockets and Gums *, and in their growth they act upon the incloſing parts in ſome degree as extraneous bodies; for while the operation of growth is going on in them, another operation is produced, which is a decay of that part of the Gum and Socket that covers the Tooth, and which becomes the cauſe of the very diſagreeable and even dangerous ſymptoms which attend this proceſs. As the Teeth advance in ſize, they are in the ſame proportion preſſing againſt theſe Sockets or Gums, from whence inflammation and ulceration are produced.

* Vide Natural Hiſtory, page 77 and 78, plate XII. fig. 3.

That

That ulceration which takes place in Dentition, is one of the ſpecies which ſeldom or never produces ſuppuration: However in ſome few caſes I have found the Gums ulcerated, and the body of the Tooth ſurrounded with matter; but I believe this ſeldom happens till the Tooth is near cutting the ſkin of the Gums.

As this is a diſeaſe of an early age, and indeed almoſt begins with life, its ſymptoms are more diffuſed, more general, and more uncertain at ſuch an early period, than thoſe of any diſorder of full grown people, putting on the appearance of a great variety of maladies; but theſe ſymptoms become leſs various, and leſs hazardous, as the child advances in years; ſo that the double Teeth of the child, and ſtill more ſo the ſecond ſet of Teeth, or thoſe of the adult, are uſually cut without producing much diſturbance.

Theſe ſymptoms are ſo various in different children, and often in the ſame child, that it is difficult to conceive them to be from the ſame origin; and the varieties are ſuch as ſeem to be beyond our knowledge.

They

They produce both local and conſtitutional complaints, with local ſympathy.

The local ſymptoms we may ſuppoſe to be attended with pain, which appears to be expreſſed by the child when he is reſtleſs, uneaſy, rubs his gums, and puts every thing into his mouth. There is generally inflammation, heat, and ſwelling of the Gums, and an encreaſed flow of ſaliva.

The conſtitutional, or general conſequential ſymptoms, are fever, and univerſal convulſion. The fever is ſometimes ſlight, and ſometimes violent. It is very remarkable both for its ſudden riſe and declenſion; ſo that in the firſt hour of this illneſs the child ſhall be perfectly cool, and in the ſecond fluſhed and burning hot, and in the third temperate again.

The partial or local conſequential ſymptoms are the moſt various and complicated; for the appearance they put on is in ſome degree determined by the nature of the parts they affect; wherefore they imitate various diſeaſes of the human body. Theſe ſymptoms we

ſhall

ſhall deſcribe in the order of their moſt frequent occurrence.

Diarrhœa, coſtiveneſs, loſs of appetite, eruptions on the ſkin, eſpecially on the face and ſcalp, cough, ſhortneſs of breath, with a kind of convulſed reſpiration, ſimilar to that obſervable in the hooping cough, ſpaſms of particular parts, either by intervals or continued, an increaſed ſecretion of urine, and ſometimes a diminution of that ſecretion, a diſcharge of matter from the *penis*, with difficulty and pain in making water, imitating exactly a violent *gonorrhœa*.

The lymphatic glands of the neck are at this time apt to ſwell; and if the child has a ſtrong tendency to the ſcrofula, this irritation will promote that diſeaſe.

There may be many other ſymptoms with which we are not at all acquainted, the patients in general not being able to expreſs their feelings. Many of the ſymptoms of this diſeaſe are dangerous, namely, the conſtitutional ones, and alſo thoſe local ſymptoms which attack a vital part. The fever, indeed, ſeldom laſts ſo long as to be fatal; but the convulſions, eſpecially

when

when univerſal, frequently are ſo. Local convulſions, if not in a vital part, although often very violent, do not kill; and when any part not vital ſympathizes, the patient is generally free from danger; a ſecurity to the whole being obtained by the ſufferings of a part which is of little conſequence to life.

Univerſal ſympathy ſeems to be the firſt effect of irritation, and in general appears as ſuch in thoſe whoſe local and partial ſenſation, and irritability, are not yet formed; for, in ſuch ſubjects, when one part is irritated, the whole ſympathizes, and general convulſions enſue. But as the ſenſations and partial irritability begin to be formed, each part, in ſome degree acting for itſelf, acquires its own peculiarities; ſo that when a local diſeaſe takes place in a patient that is very young, it is capable of giving a general diſpoſition to ſympathize; but as the child advances, the power of ſympathy becomes partial, there not being now in the conſtitution that univerſal conſent of parts; but ſome one part is found which has a greater aptitude than the reſt to fall in with the local irritation; therefore the whole diſpoſition for ſympathy is directed to ſome particular part, and it ſympathizes according to its own peculiar ac-

tion. This ariſes from the different organs acquiring more and more their own independent ſenſations as the child grows older; and gradually loſing the power of ſympathiſing with one another: ſo that by the age of ſix years few parts ſuffer but thoſe immediately affected; and in adults, who cut their Teeth, we almoſt always find the pain and other ſymptoms confined to the part, or only local ſympathy taking place, ſuch as a ſwelling of the ſide of the face.

But as the ſymptoms become more confined, the ſuffering part is often much more violently affected, than where it has a power of taking in the other parts. Therefore we find that in adults the pain of cutting a grinder is frequently exceſſive, and that the local inflammation is very conſiderable, and often of long continuance *. This is not the caſe with children; their pain does not appear to be ſo very conſiderable, and we are certain that the local inflammation is not great; that it is confined to the very parts which ſuffer, and is not diffuſed over the face; ſo that in children the ſymptoms of ſympathy are often more violent than

* Vide Caſe the third.

thoſe

thoſe of the parts themſelves. Though it is generally a fact, that the ſymptoms of Dentition in adults are confined to the parts immediately injured, it is not always or certainly ſo; for ſometimes, as will appear from caſe the fourth, there will be the ſtrongeſt ſymptoms imaginable from ſympathy; which ſeems to be owing to a peculiar aptitude in the conſtitution to univerſal ſympathy. Theſe pains in the adult are often periodical, having their regular and fixed periods, from which circumſtance they are often ſuppoſed to be aguiſh, and the bark is adminiſtered, but without effect. Medicines for the rheumatiſm are likewiſe given, with as little ſucceſs; when a Tooth will appear, and diſcloſe the cauſe of the complaint; and by lancing the gums the cure often is performed, but the diſeaſe will recur if the gum happens to heal over the Tooth, which it will very readily do, if the Tooth is pretty deep. As theſe Teeth are generally ſlower in their growth than the others, and more eſpecially thoſe which come very late, they become the cauſe of many returns of the ſymptoms. How far children under this circumſtance are ſubject to paroxyſms of the diſeaſe, is not an eaſy thing to determine; but from many of their ſympathetic

ſymptoms going off and returning, it would appear that they have alſo their exacerbation.

Of the CURE.

THE cure of diſeaſes ariſing from Dentition, from their nature, can only be temporary and local, even when it is directed to the real ſeat of the diſeaſe; and certainly every method of cure which is not ſo directed, muſt prove ineffectual, as it can only operate by deſtroying the effect. Opiates, indeed, will in ſome degree take off the irritation, by deſtroying the ſenſibility of the part; but ſurely it would be better at once to remove the cauſe, than to be attempting from time to time to remove or palliate the effect. When the ſympathy is partial, and not in a vital part, it would be better to allow it to continue than cure it, becauſe it may by ſuch means become univerſal: for inſtance, if it is a diarrhœa, the beſt way is to allow it to go on, or at leaſt only correct it if too violent, which is often the caſe. I have ſeen caſes, where the ſtomach and inteſtines have ſympathized ſo much, as almoſt to threaten death.

death. The ſmall quantity of nouriſhment that the ſtomach could admit of, was hurried off by the inteſtines.

Of cutting the GUMS.

AS far as my experience has taught me, to cut the gum down to the Teeth appears to be the only method of cure. It acts either by taking off the tenſion upon the gum, ariſing from the growth of the Tooth, or by preventing the ulceration which muſt otherwiſe take place.

It often happens, particularly when the operation is performed early in the diſeaſe, that the gum will reunite over the Teeth; in which caſe the ſame ſymptoms will be produced, and they muſt be removed by the ſame method.

I have performed the operation above ten times upon the ſame Teeth, where the diſeaſe had recurred ſo often, and every time with the abſolute removal of the ſymptoms.

It has been aſſerted, that to cut the gum once will be ſufficient, not only to remove the preſent, but to prevent any future bad ſymptoms from the ſame cauſe. This is contradictory to experiment, and the known laws of the animal œconomy; for frequently the gum, from its thickneſs over the Tooth, or other cauſes, muſt neceſſarily heal up again, and the relapſe is as unavoidable as the original diſeaſe.

A vulgar prejudice prevails againſt this practice, from an objection, that if the gum is lanced ſo early, as to admit of a re-union, the cicatriſed part will be harder than the original gum, and therefore the Teeth will find more difficulty in paſſing, and give more pain. But this is alſo contrary to facts; for we find that all parts which have been the ſeat either of wounds or ſores, are always more ready to give way to preſſure, or any other diſeaſe which attacks either the part itſelf or the conſtitution. Therefore each operation tends to make the paſſing of the Teeth eaſier.

When the Teeth begin to give pain, we find them generally ſo far formed, as to be eaſily diſcerned through the gum.

The

The fore Teeth are to be obſerved at firſt, not on the edge of the gum, but on the fore part, making riſings there, which appear whiter than the other parts: and it may be obſerved, that the gums are broader than uſual. At this period the inciſions muſt be made pretty deep, till the Tooth be felt with the inſtrument, otherwiſe little effect will be produced by the operation: and this is the general rule with reſpect to the depth of the inciſion in all caſes.

When the grinders ſhoot into the gum, they flatten the edge of the gum, and make it broad. Theſe Teeth are more eaſily hit by the inſtrument than the fore Teeth.

The operation ſhould not be done with a fine pointed inſtrument, ſuch as a common lancet, becauſe moſt probably the point will be broken off againſt the Tooth, which will make the inſtrument unfit for going on further, if more inciſions are required.

A common lancet, with its point rounded, is a very good inſtrument; but an inſtrument, ſomething like

like a fleam, would be of the moſt convenient ſhape.

There is no need of any great delicacy in the operation, the gums being very inſenſible parts; and to cut through the whole gum down to the Teeth with certainty, when they are pretty deep, requires ſome force.

The gums will bleed a little, which may be of ſervice in taking off the inflammation. I never ſaw a caſe, where the bleeding either proved inconvenient or dangerous. If it ever ſhould be troubleſome, I think there could be no great difficulty in ſtopping it. In general, no application is neceſſary: the gums ſoon unite at the moſt diſtant part from the Tooth, if it lies deep; and if it be more ſuperficial, the thin gum ſoon ſhrinks back over the Tooth, leaving it bare, and decays.

This cutting of the *dentes ſapientiæ* is often attended with an inconvenience, which does not attend the others; and this happens, I believe, only when they come

come very late, *viz.* when the jaws have left off growing. This is the want of room in the jaws for theſe late Teeth; a circumſtance which produces an addition to the other inconveniencies ariſing from Dentition. When it takes place in the upper jaw, the Tooth is often obliged to grow backwards; and in ſuch a poſition it ſometimes preſſes on the interior edge of the coronoide proceſs, in ſhutting the mouth, and gives great pain. When it takes place in the lower jaw, ſome part of the Tooth continues to lie hid under that proceſs, and covered by the ſoft parts, which are always liable to be ſqueezed between that Tooth and the correſponding Tooth in the upper jaw. To open very freely, is abſolutely neceſſary in theſe caſes: but even that is often not ſufficient. Nothing but drawing the Tooth, or Teeth, will remove the evil in many caſes.

CASES.

It would be endleſs to give hiſtories of caſes, exemplifying each ſymptom of Dentition. I ſhall only relate a few which are ſingular; and which, being

extraordinary, will the better enforce the propriety, in all caſes, of the cure I have recommended.

Case I.—A young child was attacked with contractions of the *muſculi flexores* of the fingers, and alſo of the toes. Theſe contractions were ſo conſiderable as to keep her fingers and thumb conſtantly clinched, and ſo irregularly, that they appeared diſtorted. All the common antiſpaſmodic medicines were given, and continued for ſeveral months, but without ſucceſs.

I ſcarified the gums down to the Teeth, and in leſs than half an hour all the contractions had ceaſed. This, however, only gave relief for a time. The gums healed; the Teeth continued to grow, and filled up the new ſpace acquired by the ſcarifications; and the ſame ſymptoms appeared a ſecond time.

The former operation was immediately performed; and with the ſame ſucceſs.

Case II.—A boy, about two years of age, was taken with a pain and difficulty in making water; and voided matter from the *urethra*. I ſuſpected that by

ſome

ſome means or other this child might poſſibly be affected by the venereal poiſon; and the ſuſpicion naturally fell on the nurſe.

Theſe complaints ſometimes abated, and would go off altogether; and then return again. It was obſerved at laſt, that they returned only upon his cutting a new Tooth: this happened ſo often, regularly and conſtantly, that there was no reaſon to doubt but that it was owing to that cauſe.

Case III.—A lady, about the age of five or ſix and twenty years, was attacked with a violent pain in the upper jaw; which at laſt extended through the whole ſide of the face, ſimilar to a violent Tooth-ach, from a cold; and was attended with conſequent fever.

It was treated at firſt as a cold; but, from its continuance, was afterwards ſuppoſed to be nervous.

The caſe was repreſented to me from the country; and I gave the beſt directions, that I could, on a repreſentation of the ſymptoms.

She came to London ſome months after, ſtill labouring under the ſame complaint. Upon examining the mouth, I obſerved one of the points of the *dens ſapientiæ* ready to come through. I lanced the gums, and the diſorder gave way immediately.

A lady, about the ſame age, was attacked with a violent pain in the left ſide of her face. It was regularly periodical; coming on at ſix o'clock in the evening. She took the Peruvian bark, which had no effect. She took antimonials, and Dovar's powder, which alſo were equally ineffectual. But one of the points of the *dens ſapientiæ* of the upper jaw, of the ſame ſide, appearing, ſhewed the cauſe, and indicated the remedy. The gums were lanced; and the pain ceaſed.

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THE END.

ADVERTISEMENT.

MOST of the Obſervations contained in the following Treatiſe were made by the Author before the Year 1755; and the Subſtance of them conſtantly demonſtrated after that Period, in Dr. Hunter's Courſe of Anatomical Lectures. The Figures were drawn by Mr. Rymſdyk, under the Author's Direction, and engraved by Meſſ. Strange, Grignion, Ryland, and others.

EXPLANATION

OF THE

PLATES.

PLATE I.

FIG. I.

A Repreſentation of the under-ſide of the Upper-Jaw, without the Teeth.

aaaaa The outer line of the circle, or what is commonly called the outer plate of the Alveolar proceſs.

bbb The inner line of the circle, commonly called the inner plate.

cc The 10 ſingle Sockets, viz. for the Inciſores, Cuſpidati, and Bicuſpides.

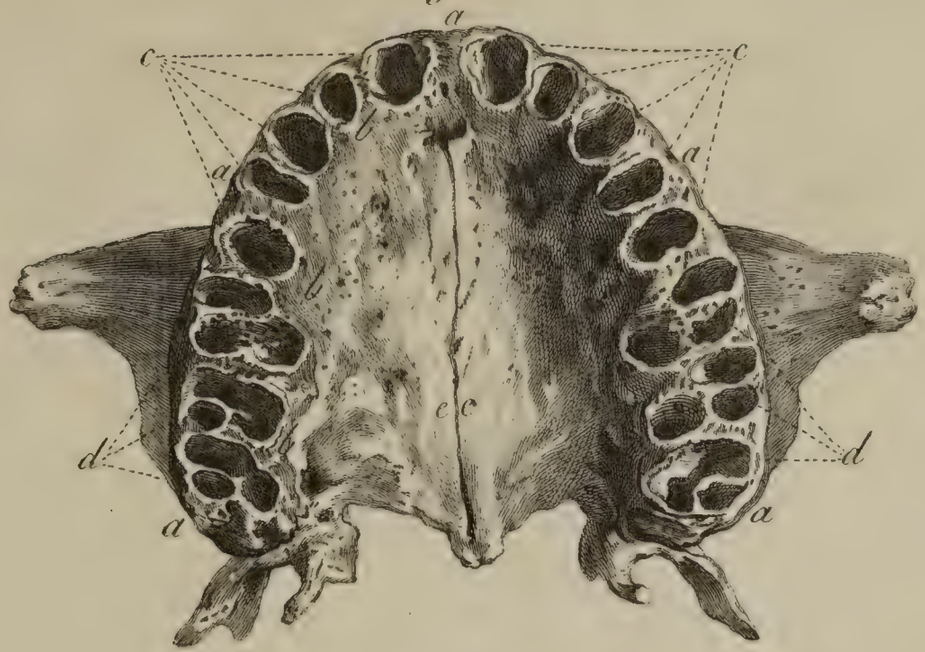
dd The 3 double Sockets for the Molary, or triple-fanged Teeth. The two firſt have three ſockets, and the laſt only two.

Fig. II. A repreſentation of the upper part of the Lower-Jaw, ſhewing particularly the Sockets of the Teeth.

a The Sockets of the ten ſingle-fanged Teeth.

b The ſockets of the 3 double-fanged Teeth.

Fig. 1.



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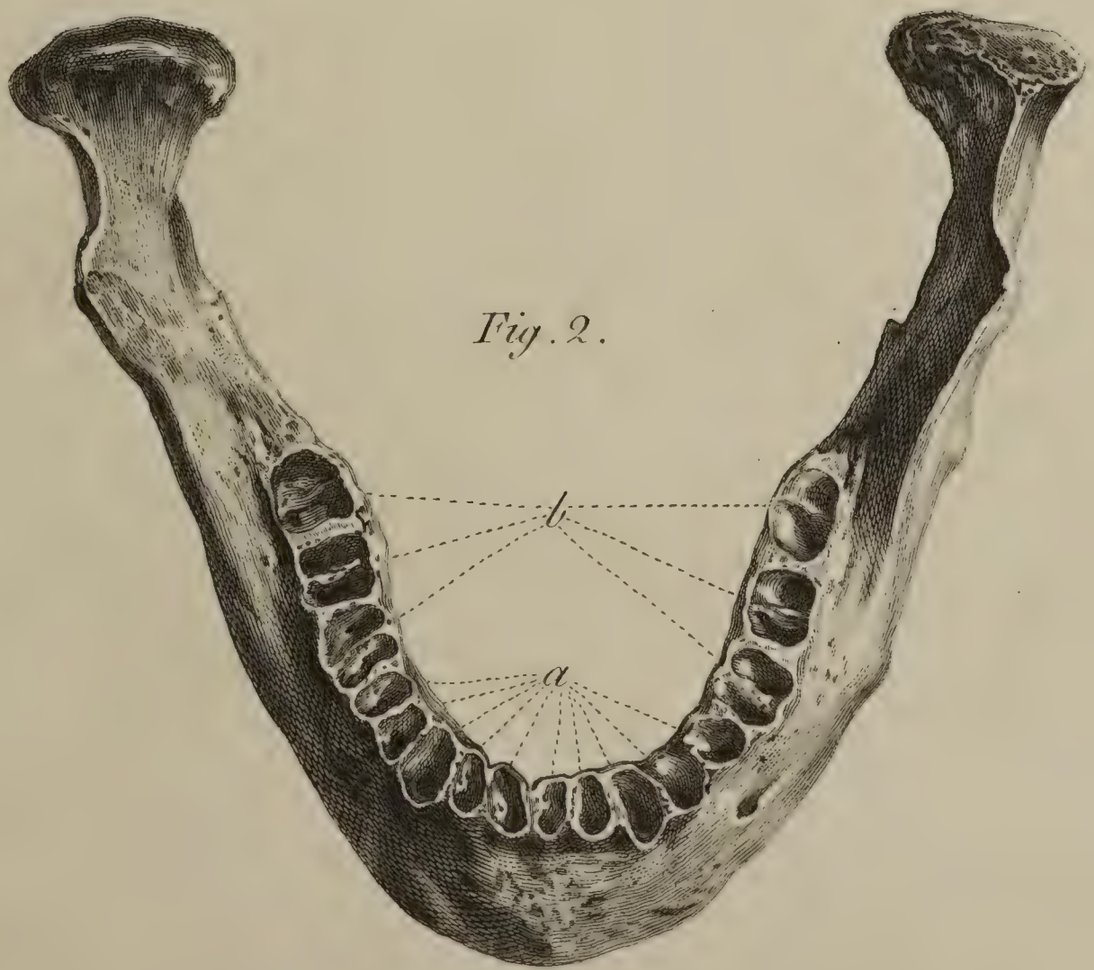

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PLATE II.

A Sketch of the Head to explain what was ſaid of the motions of the Lower-Jaw.

A The Section of the Head which was made to bring the Articulation of the Lower-Jaw into view.

B Lower-Jaw.

C The condyle of the Lower-Jaw.

D The occipital condyle of the Head.

E F The Digaſtric Muſcle.

E Its origin.

F Its inſertion.

G G G The *Vertebræ* of the Neck.

H The *Meatus Auditorius externus.*

I The hollow, or cavity in the temporal bone for the articulation of the Lower-Jaw.

K The eminence before that cavity, likewiſe for articulation.

L The moveable cartilage of the Joint.

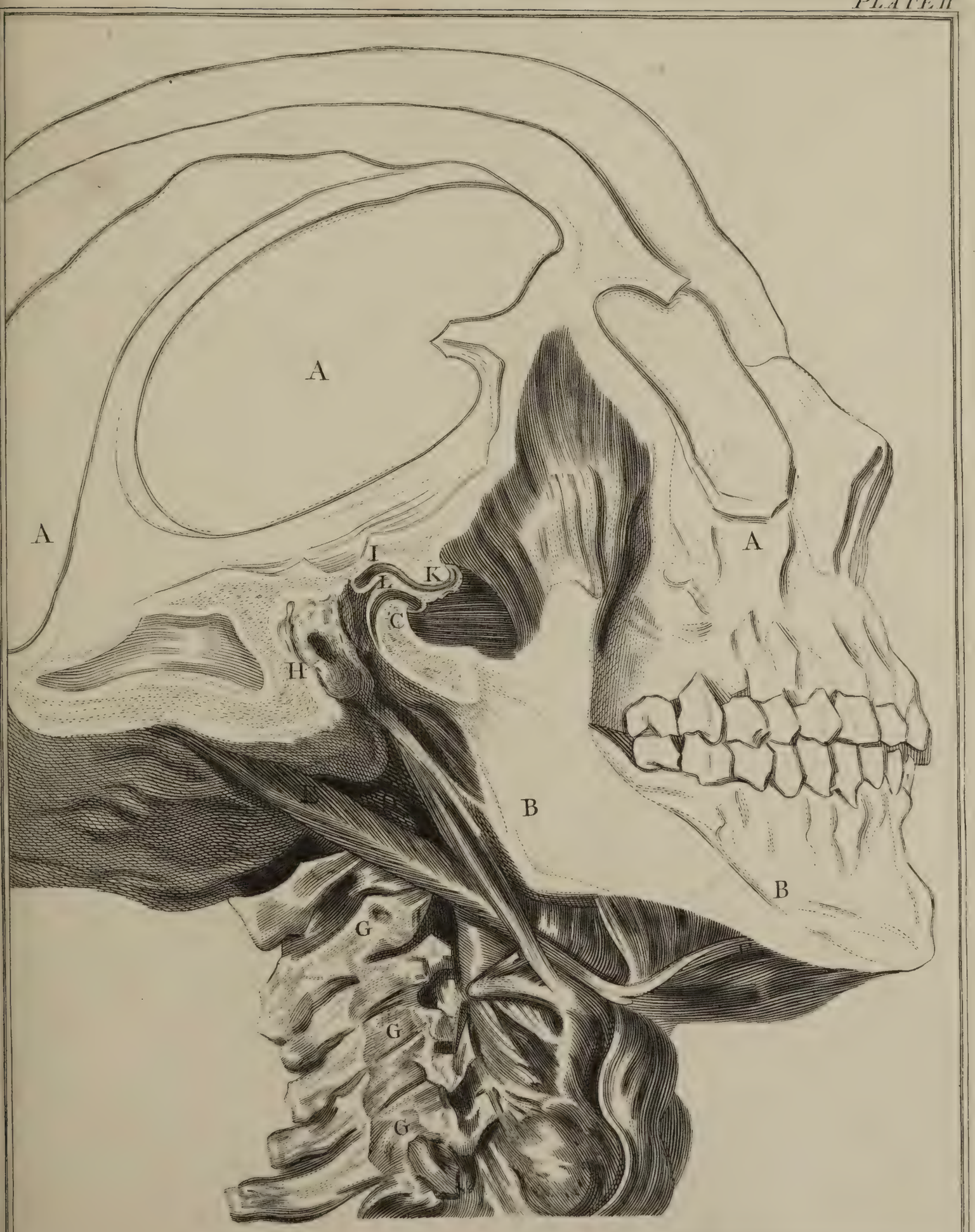

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PLATE IV.

Fig. I. The baſis of the ſkull, and of the Upper-Jaw, with a full ſet of Teeth; ſhewing the cutting edges and grinding ſurfaces of the Teeth of the Upper-Jaw, and the cavity and eminence of the temporal bone for the articulation of the Lower-Jaw.

a a a a The four *Inciſores.*

b b The two *Cuſpidati.*

c c The four *Bicuſpides.*

d d The ſix Grinders.

e e The two cavities in the temporal bones for the articulation of the condyles of the Lower-Jaw.

f f The two eminences upon which the condyles move, in many actions of that bone.

Fig. II. A view, from above and behind, of the Lower-Jaw, with a full ſet of Teeth; ſhewing the cutting edges and grinding ſurfaces of the Teeth in that Jaw, with the Coronoid Proceſſes, and condyles for articulation.

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c c The four *Bicuſpides.*

d d The ſix Grinders.

e e The Coronoid Proceſſes.

f f The Condyles.

Fig III. The moveable cartilage of the joint of the Lower-Jaw.

a The cut ſurface of a longitudinal ſection of it. The lower and concave ſurface is what is articulated with the Condyle; the upper and convex ſurface is what is in contact with the Temporal Bone.

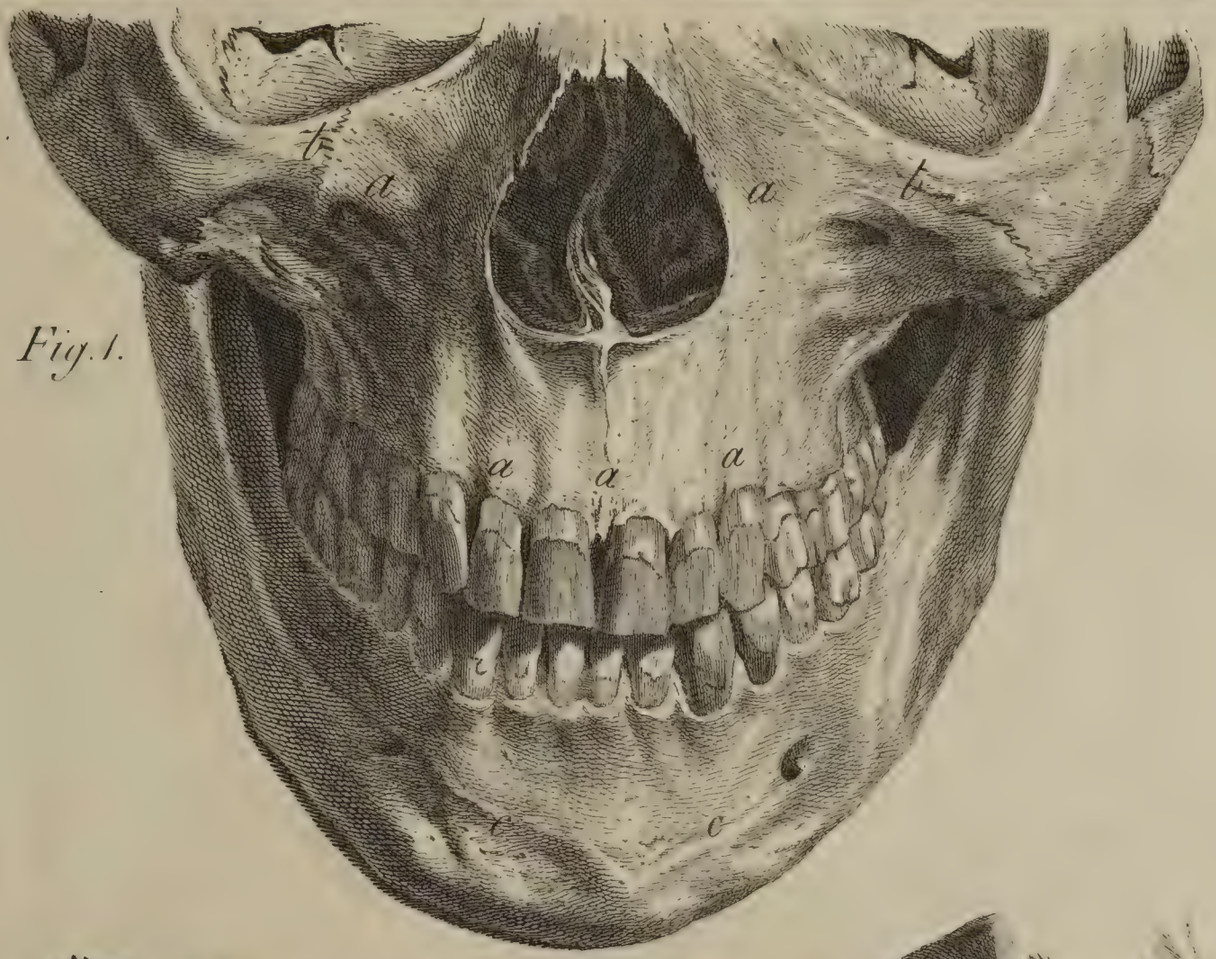

Fig. 1.

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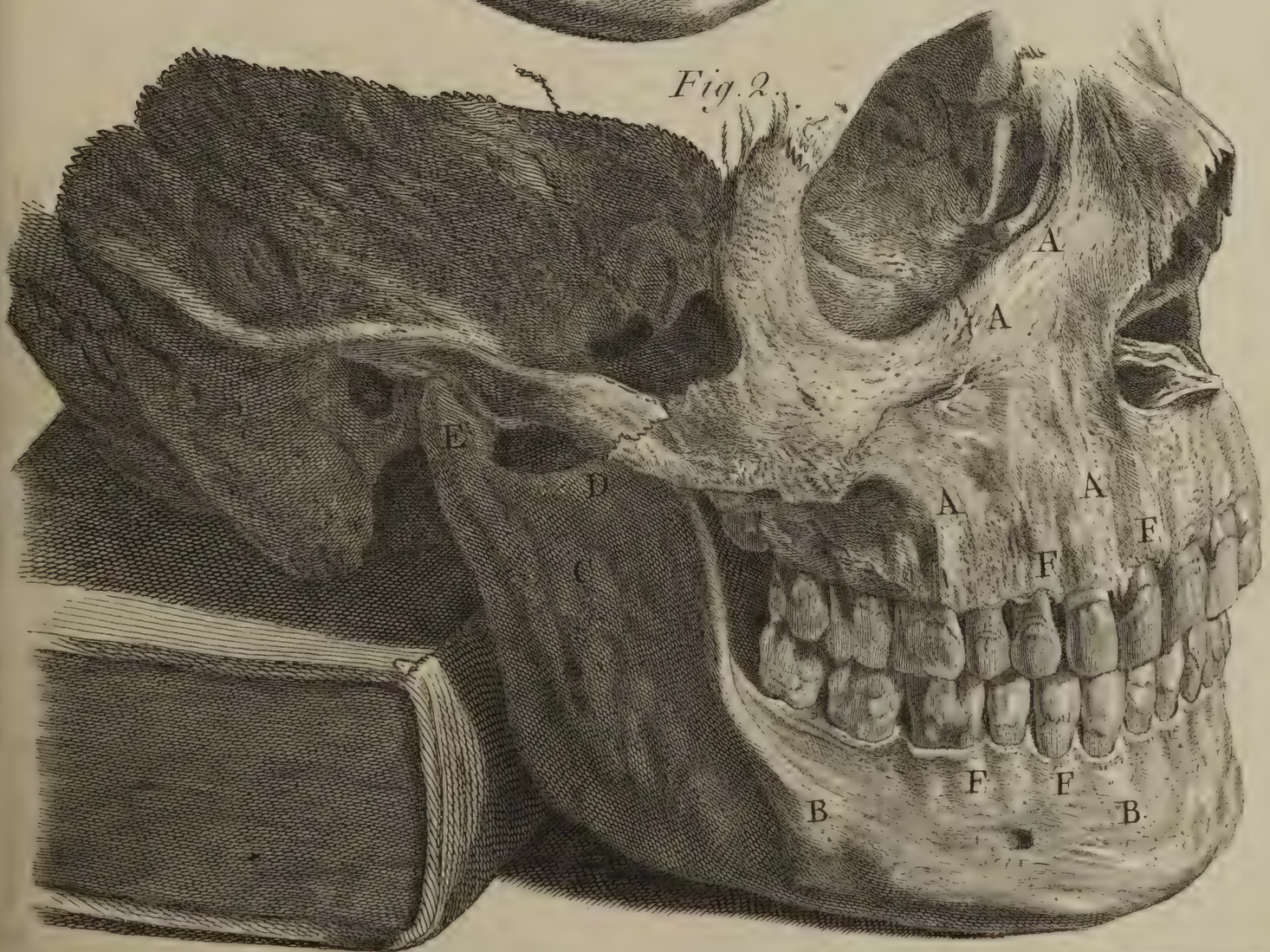

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Fig. 1.

Fig. 2.

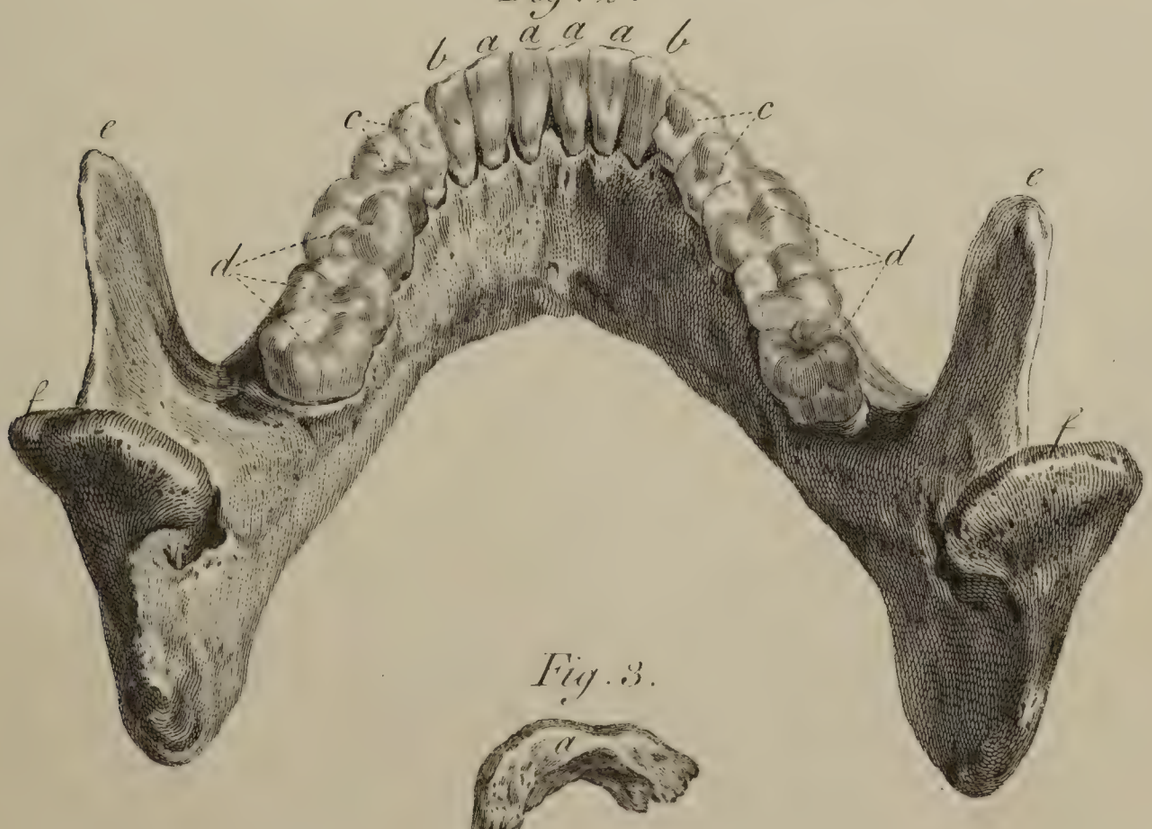

Fig. 3.

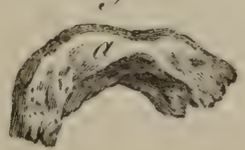

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PLATE V.

Two views of the ſixteen Teeth of one ſide of both Jaws, taken out of their ſockets to expoſe the whole of each Tooth.

Row 1. The Teeth of the Upper Jaw, ſeen from the outſide.

Row 2. The ſame view of the Teeth of the Lower-Jaw: the five ſingle are ſimilar to thoſe in the Upper-Jaw, but the Grinders in this have only two fangs.

a a The two *Inciſors.*

b The *Cuſpidatus*, ſhewing in the ſame view how much it is longer than the others.

c c The *Bicuſpides.*

d d The two firſt Grinders, having three fangs.

e The third Grinder, or *Dens Sapientiæ* having alſo three fangs.

Row 3 and 4. A ſide view of the ſame Teeth, ſhewing that the *Inciſores* and *Cuſpidati* in this view differ from the former view more than the *Bicuſpides* or Grinders.

Row 3, *a a* The two *Inciſores* of the Upper-Jaw, ſhewing the hollowed inner ſurface of the body of thoſe Teeth.

b The *Cuſpidatus*, ſhewing the ſame.

c c The *Bicuſpides*, ſhewing the two points on the baſis of each. The firſt of them has a forked fang.

Row 1.

Row 2.

Row 3.

Row 4.

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PLATE VI.

Fig. I. A ſide view of the Upper and Lower-Jaw, in which the outer plate of the Alveolar Proceſs was taken off to expoſe the Fangs of the Teeth in their ſockets. The length of each fang is at once ſeen with reſpect to its neighbour, and this kind of articulation pointed out at one view.

Fig. II. A view of the inſide of the Teeth of both Jaws in their natural ſituation when the mouth is ſhut. In this view the ſpectator's eye is ſuppoſed to be placed behind and below the two Jaws.

Fig. 1.

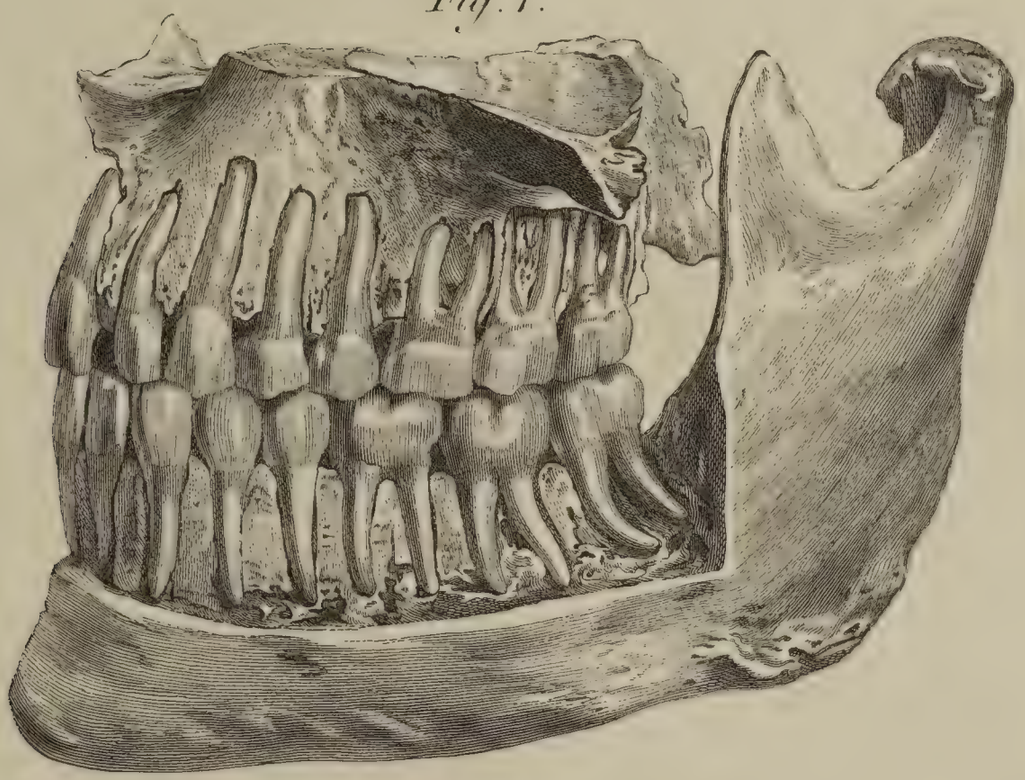

Fig. 2.

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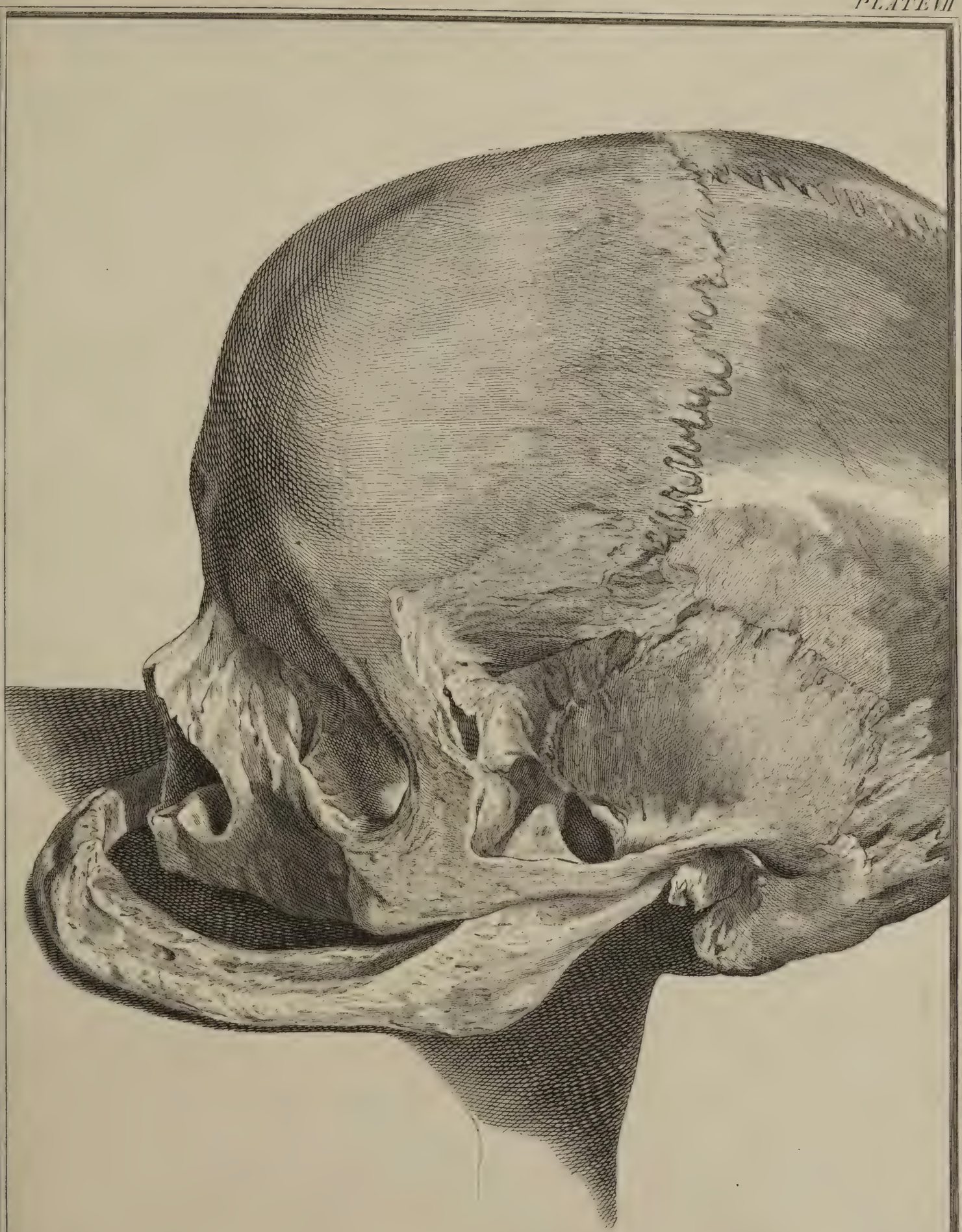
PLATE VII.

The bones of the head of a very old woman, who had loſt her Teeth a conſiderable time before death. The whole Alveolar Proceſſes are gone in both Jaws, which allows of the Lower-Jaw being raiſed about two Inches higher than what is common in ſhutting the mouth, before the gums of both Jaws can come into contact; by this increaſed motion of the Lower-Jaw, the chin is brought more upon a line with the articulation, therefore projects beyond the Upper-Jaw conſiderably.



T. Van Riemsdyk fecit.

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T. Fougeron fculp.

PLATE VIII.

This plate ſhews the gradual growth of the two Jaws, eſpecially of the Alveolar Proceſſes.

Fig. I. and II. One ſide of the Lower and of the Upper-Jaw of a Fœtus about three or four months old.

a a The groove which is afterwards formed into Sockets.

Fig. III. and IV. One ſide of the Lower and of the Upper-Jaw of a Fœtus about ſix months old, at which age (*a a*) ſome of the partitions have ſhot acroſs near the anterior part, forming diſtinct cells.

Fig. V. and VI. The Upper and Lower-Jaw of a new born child, ſhewing the laſt mentioned circumſtance in a more advanced ſtate.

Fig. VII. The Lower-Jaw of a child ſeven or eight months old, in which the two firſt *Inciſores* had cut the gum, ſhewing the ſockets of ſix Teeth.

a a The mouths of the Alveoli contracted over the Teeth, eſpecially thoſe of the Grinders, where they have not yet begun to open for the paſſage of the Teeth.

Fig. VIII. A ſketch of an Upper-Jaw where the *Cuſpidatus* of that ſide had been formed high up in the Jaw, and therefore never could appear through the Gum. *a* The fang of the *Cuſpidatus*. *b* Its body contained in the Upper-Jaw and Alveolar Proceſs.

Fig. IX. A ſketch of the Upper-Jaw of a child, where the *Cuſpidatus* was inverted, ſo that its point was turned up againſt the Jaw, and the growing mouth of its cavity towards the Gum. *a* The point of the *Cuſpidatus* turned up againſt the Jaw. *b* The open and growing part of the Tooth which ſhould be formed into a fang.

Fig. X. The out-line of the Lower-Jaw of a child, to ſhew that the Condyle is then nearly on a line with the Gums.

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PLATE IX.

Fig. I. One ſide of the Upper and Lower-Jaw of a ſubject about eight or nine years of age, where the *Inciſores* and *Cuſpidati* of the Fœtus were ſhed, and their ſucceſſors riſing in new ſockets; ſhewing likewiſe the two Grinders of the child, with the *Bicuſpides* forming underneath. The firſt adult Grinder was ready to cut the Gum; and the ſecond Grinder in the Lower-Jaw is lodged in the root of the Choronoid Proceſs, and in the Upper-Jaw it is in the tubercle.

Fig. II. Part of the Lower-Jaw cut through at the ſymphyſis. The *Inciſor* of the child is ſtanding in its ſocket, and the adult *Inciſor* forming in a diſtinct ſocket underneath.

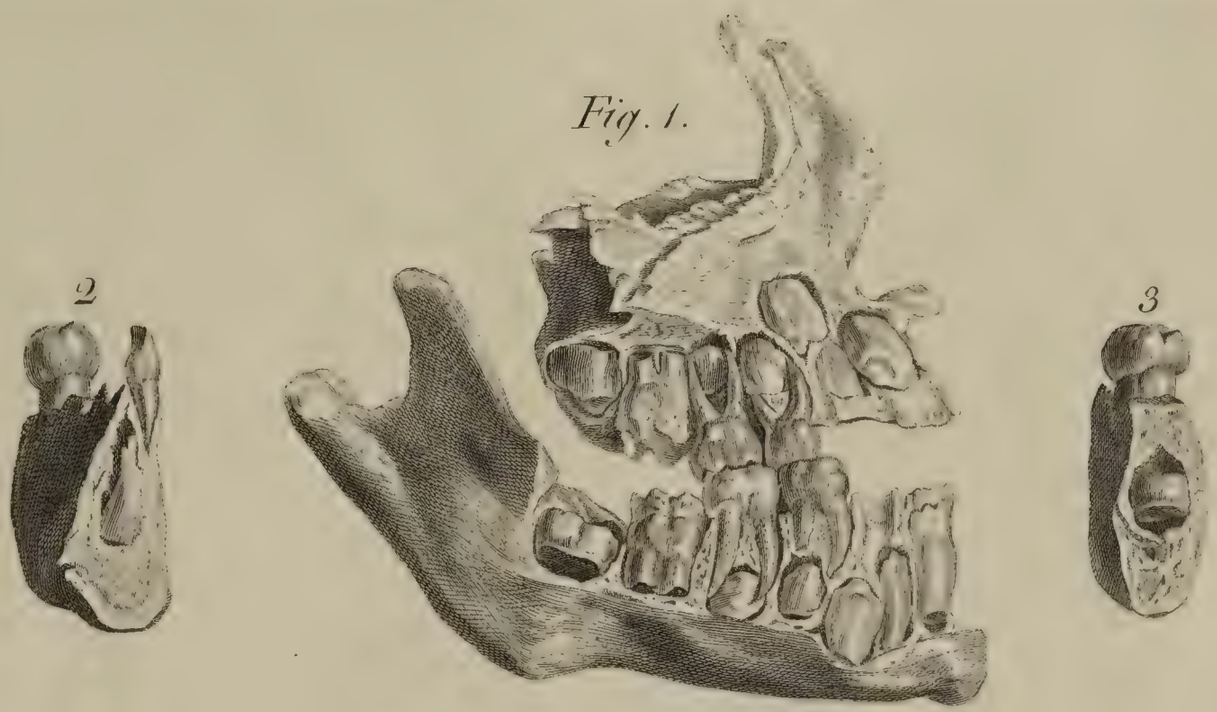
Fig. III. Another view of the ſame piece of the Jaw, to ſhew that the *Bicuſpides* are formed in diſtinct ſockets of their own, and not in the ſocket of the Grinder which ſtands above.

Fig. IV. The five Teeth in the half of each Jaw of a Fœtus of ſeven or eight months, ſhewing the progreſs of oſſification from the firſt *Inciſor* to the ſecond Grinder.

Fig. V. The ſame teeth ſomewhat farther advanced.

Fig. VI. The Teeth of a child of eight or nine years of age, ſhewing the five temporary Teeth in a more advanced ſtate, with the firſt adult Grinder. The adult *Inciſores* and one *Cuſpidatus* are alſo begun to be formed.

Fig. 1.



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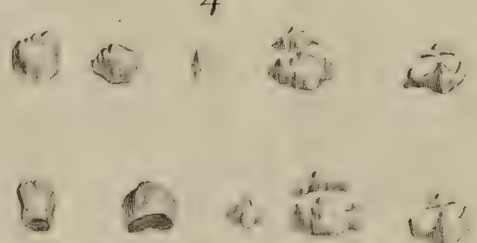

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PLATE X.

Fig. I. The Teeth of one ſide of both Jaws, from a child of five or ſix years of age. B B, C C The temporary Teeth almoſt completely formed. A D, Seven, viz. four above and three below, of the ſucceeding Teeth ſeen at the roots of the firſt ſet. E E, The body of the firſt adult Grinder nearly formed.

Fig. II. The Teeth of one ſide of both Jaws, from a child of ſeven years of age. This is an age in which there are more Teeth formed and forming than at any other time of life. B B, C C, The ten temporary Teeth complete. A D, Ten incomplete to ſucceed them. E E, Two adult Grinders; making twenty-two in this ſide, and of courſe forty-four in the whole. *a a a a*, The Fangs of the temporary *Inciſors* beginning to decay at their points.

Fig. 1.

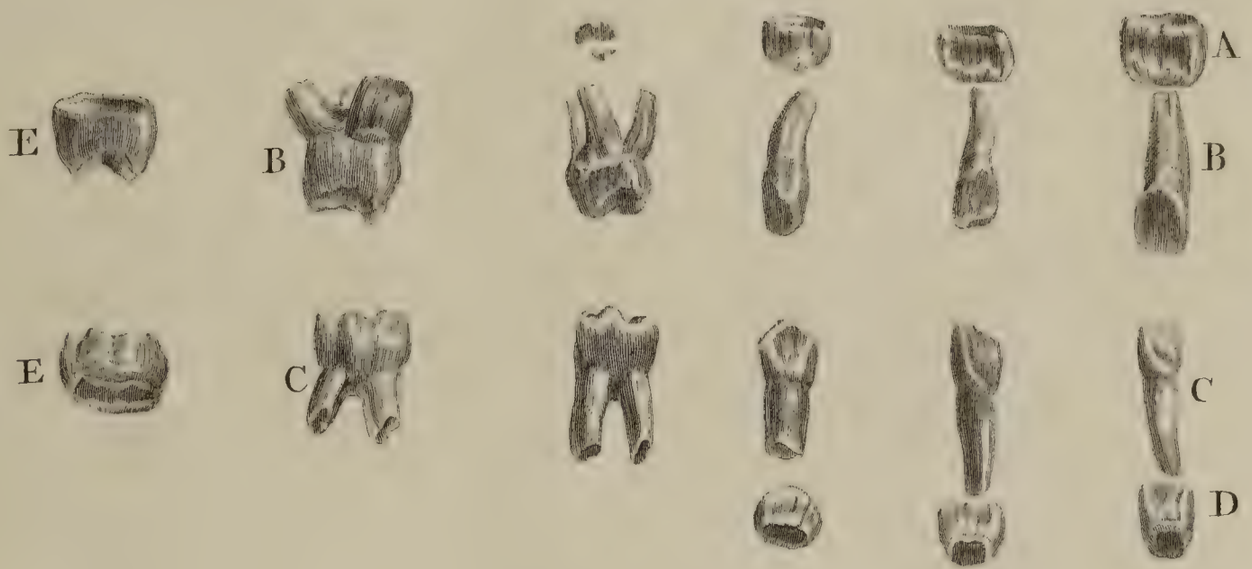

Fig. 2.

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PLATE XI.

Fig. I. The Teeth of a child eight or nine years old; principally to ſhew the progreſs of the ſecond Set, and the beginning and decay of the firſt Set.

A A, The firſt *Inciſores* of the ſecond or permanent Set. B. The ſecond *Inciſor*. C. The *Cuſpidatus*. D E, The *Bicuſpides*. F G, The two firſt *Molares*.

a b, The temporary *Inciſores*, the firſt of which in the lower Jaw is wanting, having been ſhed. *c*, The *Cuſpidati*. *d e*, The temporary *Molares*.

Fig. II. The Teeth of a youth about eleven or twelve years old, ſhewing the farther progreſs of the one Set towards perfection, and of the other in their decay.

a a a a, The *Inciſores* of the ſecond Set, which had all cut the Gum. *b b*, The Baſis of the third *Molaris* or *Dens Sapientiæ*. *c c*, The remaining *Molares* of the firſt Set, with decayed Fangs. *d d*, The two firſt *Molares* of the ſecond Set, ſo much advanced that they had cut the Gums.

Fig. 1.

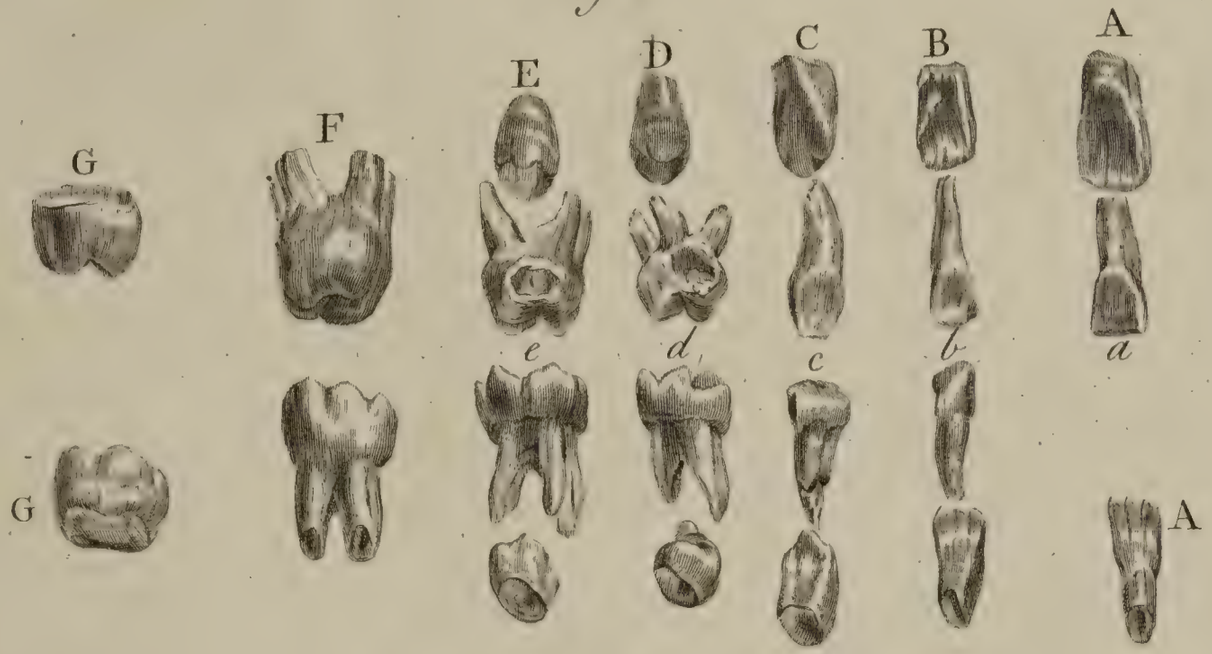

Fig. 2.

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PLATE XII.

Fig. I. The Lower-Jaw of a Fœtus, from which part of the Gum and bony ſocket is taken off, to expoſe the membrane which incloſes the Teeth. *a*, The upper edge of the gum. *b b b*, The membrane which covers the Teeth.

Fig. II. The Upper-Jaw of the ſame Fœtus, ſhewing the ſame membrane in that Jaw.

Fig. III. The Lower-Jaw of a new-born child, where this incloſing membrane is opened, to ſhew the bodies of the Teeth that were covered by it. The blood veſſels which run in its ſubſtance are alſo expoſed.

a, The body of the Tooth. *b*, The membrane.

Fig. IV. That part of the Jaw and Gum which contains the *Cuſpidatus*. The whole is a little magnified. The membrane is opened and turned off on each ſide, and the fore part is turned down. The upper part of the pulp is covered with its bony ſhell, which is ſeen by its want of veſſels.

a, The oſſified part of the Tooth. *b*, The pulp. *c c*, The membrane opened and turned back.

Fig. V. and VI. Two pulps magnified. Fig. V. The pulp of the *Cuſpidatus*, Fig. VI. That of the Grinder. The oſſifications are removed, to ſhew that the pulp is of the ſame ſhape with the Tooth which is formed upon it. As far down on the pulp as the veſſels are ſeen, the oſſification had advanced; which ſhews that it is more vaſcular where the operation of oſſification is going on. The lower ragged edge, *a*, is part of the capſula turned down.

Fig. 7. One of the Grinders of the Lower-Jaw, ſawed down to expoſe the two cavities or canals leading to the body of the Tooth, where they unite, and form a ſquare cavity. In theſe two canals are ſeen two arteries, which run on to the common cavity, and there ramify. The veins are not injected. The whole is magnified.

In the body of the Tooth may be obſerved a number of ſtrata, each of which is loſt in the circumference of the Tooth.

a a, The Jaw-bone and Gum cut through. *b*, The body of the Tooth. *c c*, The two fangs. *d d*, The arteries running into the cavities of the fangs.

Fig. VIII. An *Inciſor* prepared and magnified in the ſame manner, ſhewing the ſame circumſtances in that Tooth.

Fig. 1.

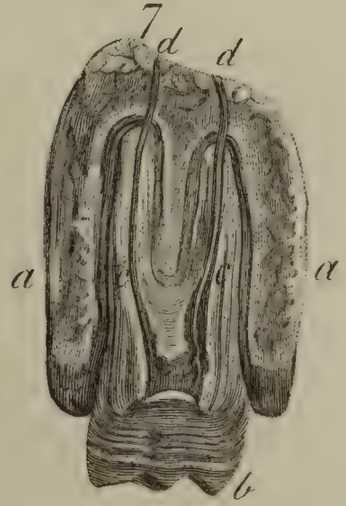

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PLATE XIII.

Fig. I. Shews the formation of the cavity and fangs of the Molares. The upper row are thoſe of the Lower-Jaw, and the lower thoſe of the Upper. A A, *a a*, is the common cavity in the body of the Tooth, which in the 2d, *a a*, is deeper than in the firſt. B ſhews the bony arch thrown over the mouth of the cavity, and dividing that into two openings which give origin to the two fangs. C D E, The progreſs of theſe fangs. F, a *Molaris* of the Upper-Jaw, where the mouth of the cavity is a little tucked in, at three different points, from which three oſſifications ſhoot. G ſhews theſe oſſifications, and the beginning of three fangs. H I K, ſhews the gradual growth of theſe fangs.

Fig. II. Is a comparative view of the Inciſors and Grinders of the child and adult; for the better underſtanding of which they are ſawed down the middle, ſhewing in a ſide view the gradual increaſe of theſe Teeth. The uppermoſt row is of the child, and the lower of the adult. *a b c d*, Shew the gradual growth of the body, fangs, and cavity of the of *Inciſors* both ages. *e f g*, Shew theſe circumſtances in the Grinders.

Fig. III. 1, 2, 3, 4, 5, 6, 7, ſhewing the gradual growth of a ſingle Tooth, from its firſt formation nearly, to its being almoſt complete.

Fig. 1.

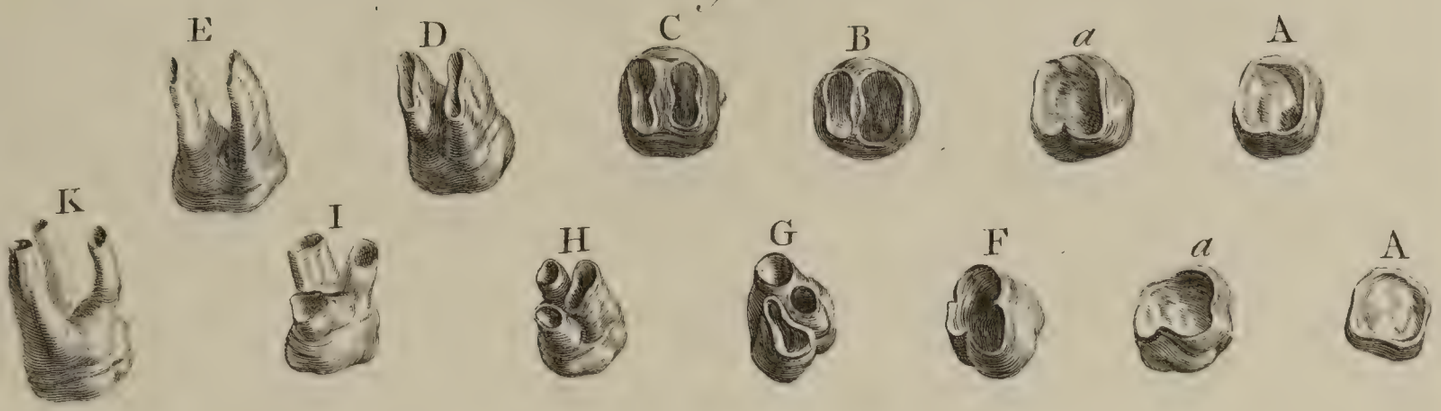

Fig. 2.

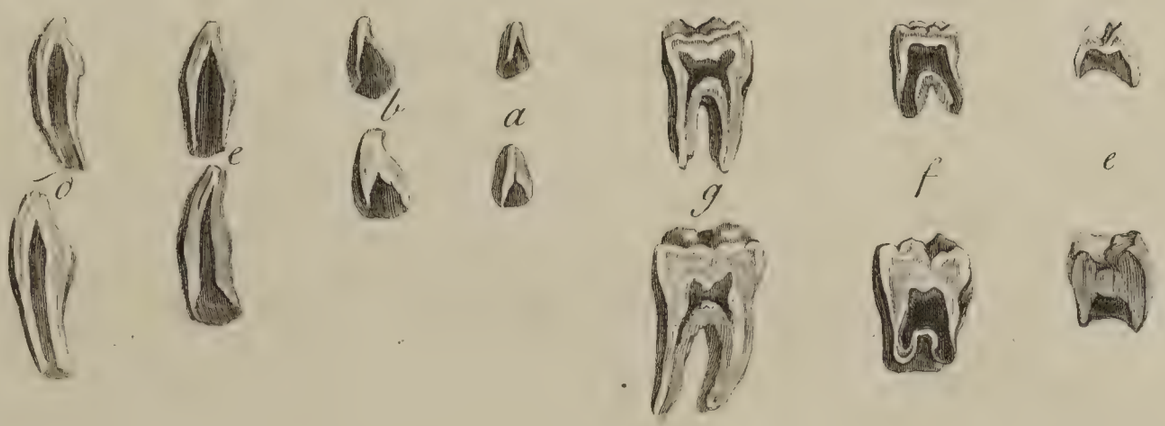

Fig. 3.

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PLATE XIV.

Fig. I. II. III. IV. V. and VI. Shew the cavities of the Teeth in the *Inſciores*, *Cuſpidatus*, *Bicuſpidatus*, and *Molares*.

Fig. VII. A *Molaris* of the Lower-Jaw, with part of its fangs ſawed off, to ſhew that the ſides of the cavity or canal have grown together, and divided it into two ſmall canals, which are repreſented by the two dark points.

Fig. VIII. and IX. The cavity in the body of the Teeth ſeen in tranſverſe ſections.

Fig. X. and XI. Longitudinal ſections of the *Molares* to expoſe the cavities.

Fig. XII. The baſis of a *Molaris* whoſe points were worn down, and the bony part which projected into thoſe points expoſed.

Fig. XIII. A *Molaris*, whoſe bony part is wholly expoſed, and only a circle of Enamel left covering the ſides all round.

Fig. XIV. and XV. A lateral view of the Enamel of a *Molaris* and a *Bicuſpis* cut longitudinally.

Fig. XVI. A *Cuſpidatus* worn ſo much down, as to expoſe the whole end of the bony part, a circle only of Enamel remaining.

Fig. XVII. An *Inciſor* ſlit down its axis, to ſhew the Enamel upon the body of the Tooth, covering much more of the convex than of the concave part.

Fig. XVIII. An *Inciſor*, ſhewing the ſame as Fig. XVI.

Fig. XIX. A horſe's Tooth ſlit down its whole length, to ſhew how the Enamel is intermixed with the bony part, and that it paſſes through the whole length of the Tooth. The Enamel is repreſented by the white lines, which are peniform, ſhewing the ſtriated texture of the Enamel.

Fig. XX. The grinding ſurface of a horſe's *Molaris*, to ſhew the irregular courſe of the Enamel.

Fig. XXI. An *Inciſor* a little magnified, ſlit down its middle, to ſhew that the Enamel is ſtriated, and that the *Striæ* are all turned towards the centre.

Fig. XXII. A Grinder in the ſame ſtate, to ſhew the ſame circumſtances.

Fig. XXIII. The baſis of a *Molaris* broken through, ſhewing that the Enamel is ſtriated in this view alſo, and that all the *Striæ* point to the centre. N. B. The Teeth muſt be broken to ſhew theſe facts.

Fig. XXIV. An old Tooth, whoſe baſis has been worn down below the original termination of the cavity in the body of the Tooth, and that end has been filled up, in the ſame proportion, with new matter, to prevent the cavity being expoſed. This matter is of a darker colour, as repreſented in the figure.

Fig. XXV. Another Tooth in the ſame ſtate.

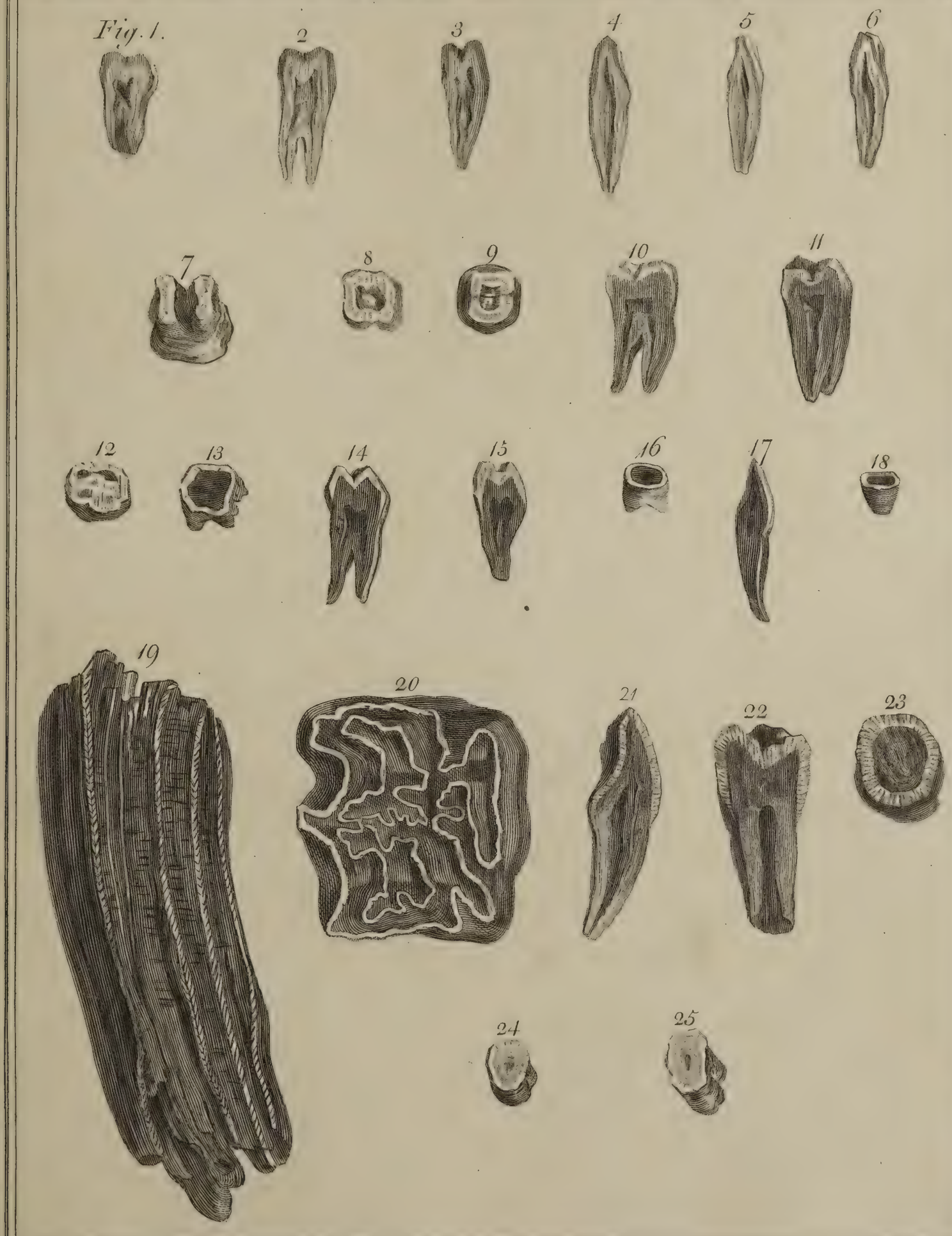

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PLATE XV.

Fig. I. A horſe's Tooth that was juſt ready to be ſhed. The three parts of the Tooth which ſtand up *a a a* incloſed the riſing end of the young Tooth. This is all that was left of a long Tooth.

Fig. II. A ſeries of Grinders of the child, from their being complete to their utmoſt decay. *a* is a Grinder of the Upper-Jaw nearly complete, in which the three fangs are almoſt formed. *b* has ſome of its fang abſorbed, *c* more, *d* ſtill more, *e* nearly all gone, and *f* the whole of the fangs gone, only the neck and body remaining.

Fig. III. A ſeries of *Inciſores* in the ſame ſtate. No. 1. A complete formed Tooth. 2. The fang ſomewhat decayed. 3. More ſo. 4. Still more. 5. The fang almoſt gone: and, 6. the whole fang gone, the neck and body only remaining.

Fig. 1.

Fig. 2.

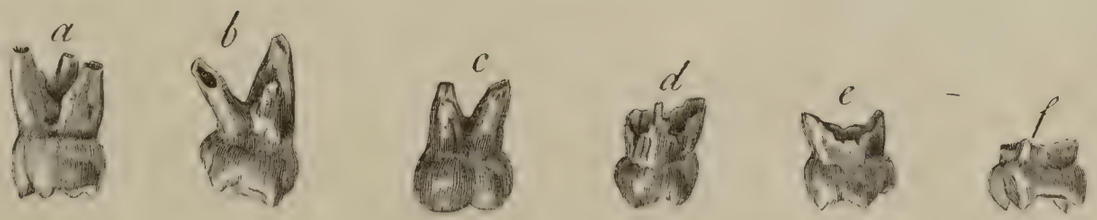

Fig. 3.

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PLATE XVI.

Fig. I. The outlines of a Lower-Jaw, in which one or two Grinders have been loſt out of the ſpace *a*, and where the bodies of the two adjacent Teeth, *b c*, have approached one another, by the preſſure which has been applied to their baſis in maſtication, from the want of their ſupport on that ſide: we ſee alſo the waſte of the *Alveoli* which belonged to the loſt Teeth.

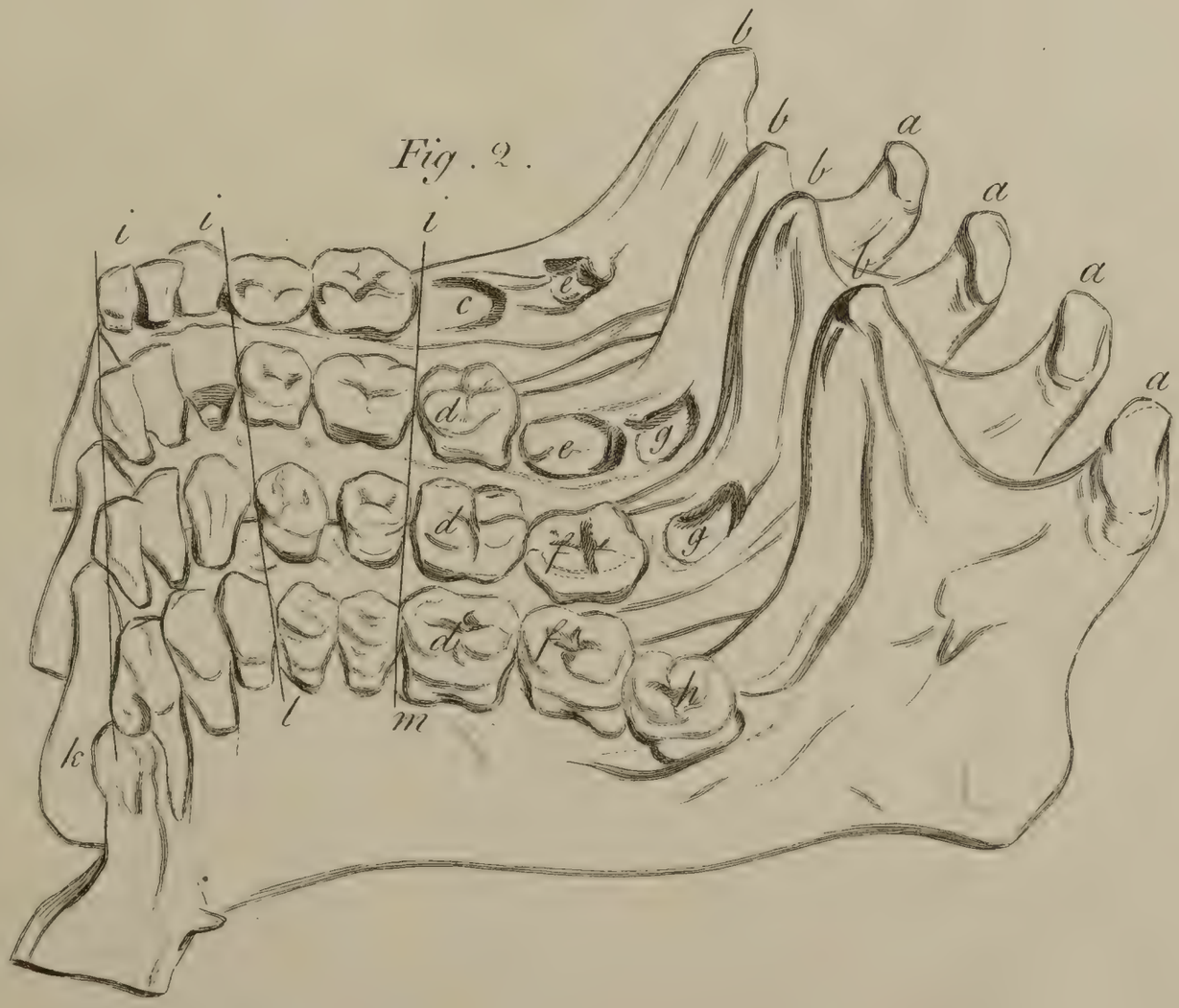
Fig. II. Four Lower-Jaws at different periods of life, from the age when the five ſhedding Teeth are completely formed, to that of a complete ſet. This figure ſhews four things: 1. The lengthening of the Jaw backwards, which is ſeen by the oblique line made by the four condyles: 2. The gradual riſe of the two proceſſes above the line of the Teeth: 3. The gradual increaſe of the Teeth in proportion as the Jaw lengthens: And fourthly, the part formed, always keeping of the ſame ſize. *a a a a* The Condyles. *b b b b* The Coronoide Proceſſes. *c* The *Alveolus*, in which the Grinder of the Adult is forming. *d d d* The firſt Grinders formed. *e e* The *Alveoli* for the formation of the ſecond Grinder. *f f* Theſe completely formed. *g g* The *Alveoli* for the third Grinder. *h* That Grinder formed.

The two lines *i k* and *i m* mark the diſtance between the ſymphyſis of the chin and ſixth Tooth; they are parallel, or nearly ſo: it is impoſſible that there ſhould be a mathematical exactneſs in four different Jaws. The line *i l* ſeparates the *Inciſores* and *Cuſpidatus* from the *Molares* in the child, and the *Bicuſpidates* in the adult. This line is oblique, and the diſtances between the two ends of the two lines, *i k* and *i l*, at *i i*, is nearly the ſame with the diſtance between the ends of the two lines *i l*, and *i m*, at *l m*.

FINIS.

Fig. 1.

Fig. 2.



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